Exabyte 17D Autoloader

Installation and Operation

Exabyte®

330838-002

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Revision History

Revision	Date	Description
000	September 1998	Beta release
001	October 1998	Initial release
002	December 1998	Change in door appearance

Note: The most current information about the autoloader can be found on Exabyte's World Wide Web site at http: //www.exabyte.com.

Exabyte Corporation
1685 38th Street
Boulder, Colorado 80301

330838-002

FCC Notice

This equipment has been tested and found to comply with the limits for a digital device, pursuant to 47 CFR, Part 15, Subpart B, Class A of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential, commercial, or light-industrial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Shielded cables are required for this device to comply with FCC Rules. **Use shielded cables when connecting this device to others**.

According to FCC regulations, changes or modifications to this equipment that are not expressly approved by Exabyte could void the user's authority to operate the equipment.

Industry Canadian Notice ICES-003 digital apparatus

Cet appareil numérique de la Classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

English translation:
This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

European Union

This equipment has been tested and complies with the following requirements:

- EN 55022/CISPR22 Class B
- EN 50082-1: 1997

Product Warranty Caution

The Exabyte® 17D Autoloader is warranted to be free from defects in materials, parts, and workmanship and will conform to the current product specification upon delivery. For the specific details of your warranty, refer to your sales contract or contact the company from which the autoloader was purchased.

The warranty for the autoloader shall not apply to failures of any unit when:

- The autoloader is repaired by anyone other than the Exabyte's personnel or approved agent.
- The autoloader is physically abused or is used in a manner that is inconsistent with the operating instructions or product specification defined by Exabyte.
- The autoloader fails because of accident, misuse, abuse, neglect, mishandling, misapplication, alteration, faulty installation, modification, or service by anyone other than the factory service center or its approved agent.
- The autoloader is repaired by anyone, including an approved agent, in a manner that is contrary to the maintenance or installation instructions supplied by Exabyte.
- Exabyte's serial number tag is removed.
- The autoloader is damaged because of improper packaging on return.

CAUTION

Returning the autoloader in unauthorized packaging may damage the unit and void the warranty.

If problems with the autoloader occur, contact your maintenance organization; do not void the product warranty by allowing untrained or unauthorized personnel to attempt repairs.

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About this manual

Use this manual for installing, operating, and maintaining the autoloader. This manual includes the following chapters:

- Chapter 1 describes how to install the autoloader.
- Chapter 2 describes how to configure the autoloader.
- Chapter 3 describes how to operate the autoloader.
- Chapter 4 describes how to operate the enclosed tape drive.
- Chapter 5 describes routine maintenance procedures.
- Chapter 6 describes shipping requirements.
- Chapter 7 describes advanced operation procedures.
- Chapter 8 describes troubleshooting procedures for the autoloader and the tape drive.
- Appendix A provides performance specifications.
- Appendix B provides SCSI specifications.
- Appendix C describes error codes.
- Appendix D describes installation procedures for the rack-mount model and the rack add-on model.

Conventions used in this manual

This manual uses the following conventions:

Enter Boxed text indicates keys on the operator panel.

Note: Notes provide additional information.

➤ **Important** Information next to the word "Important" helps you complete a procedure or avoid extra steps.

CAUTION

Boxed text under the word "CAUTION" provides information you must know to avoid damaging the autoloader or tape drive or losing data.

WARNING!

Boxed text under the heading "WARNING!" provides information you must know to avoid personal injury.

Related publications

Quantum DLT™ 4000 Tape Drive

- *DLT4000/4500/4700 Cartridge Tape Subsystem Product Manual*, 81-108336-02 (available from Quantum Corporation)

Quantum DLT 7000 Tape Drive

- *DLT 7000 Tape Drive Product Manual*, 81-111331-01 (available from Quantum Corporation)

Standards

- *ANSI Small Computer System Interface* (SCSI-2), X3.131-1994

- *ANSI Helical-Scan Digital Computer Tape Cartridge*, X3B5 / 89-136, Rev. 6

Contacting Exabyte

To obtain technical support:	
Exabyte Technical Support	1-800-445-7736
	1-303-417-7792
	1-303-417-7160 (fax)
e-mail	support@exabyte.com
EXAfacts™ Fax-on-Demand	1-800-445-7736
	1-303-417-7792
World Wide Web	http://www.exabyte.com
To order supplies and accessories:	
Exabyte Express	1-800-EXATAPE (1-800-392-8273)
	1-972-481-4221
	1-972-406-9081 (fax)
To return equipment for service:	
Exabyte Service	1-800-EXATAPE (1-800-392-8273)
	1-303-417-7199 (fax)
	Scotland: + 44-1-324-564564
e-mail	service@exabyte.com

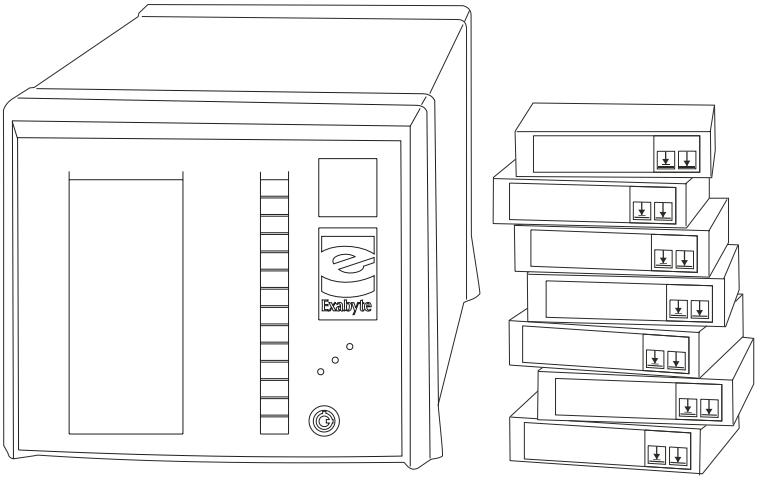
Note: If it is more convenient to your location, contact Exabyte Technical Support in Europe at the following numbers:

Phone: + 31-30-254-8890
Fax: + 31-30-258-1582

Welcome

Congratulations on selecting the Exabyte® 17D Autoloader. Your new autoloader provides unattended data storage, archiving, backup, and retrieval for small PC workgroups to mid-range networks. The autoloader's robot automatically loads and unloads data cartridges from the enclosed DLT™ tape drive.

The autoloader is available as a desktop, rack-mount, or rack add-on model. The following illustration shows the desktop model.



About the Exabyte 17D

The Exabyte 17D includes seven data cartridge slots and one Quantum® DLT™4000 or DLT™7000 tape drive. The autoloader operates as two SCSI-2 devices on one SCSI bus.

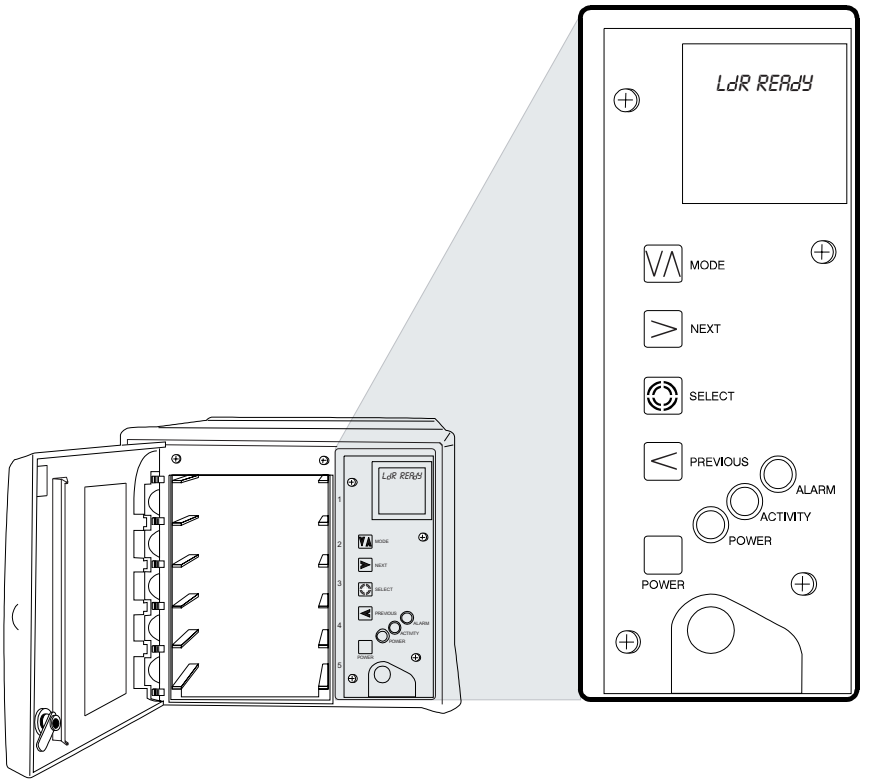
When operating with a DLT™4000 tape drive and assuming an average data compression ratio of 2:1, the autoloader can store up to 280 gigabytes (GB) of information on seven data cartridges.

When operating with a DLT™7000 tape drive and assuming an average data compression ratio of 2:1, the autoloader can store up to 490 gigabytes (GB) of information on seven data cartridges.

Autoloader components

The following sections describe the autoloader's front panel, internal, and back panel components.

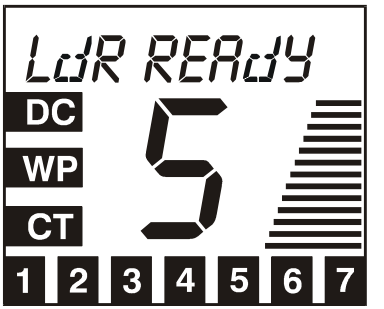
Front panel components



Operator panel

The operator panel features an LCD (liquid crystal display), a keypad, and three LEDs.

LCD. The one-line by ten-character LCD allows you to view the operational status of the autoloader and view status messages, as shown in the following figure. For information about the messages that appear on the LCD screen, see page 17.



Keypad. The keypad allows you to access a menu of operations and power cycle the autoloader. For information about the keypad functions, see page 18.

LEDs. The operator panel also features three LEDs that allow you to view autoloader status. For information about the LEDs, see page 19.

Front data cartridge slots

The autoloader contains a total of seven data cartridge slots. Five slots are located in the front section of the autoloader, and two are located in the rear section. You can access the five front slots by manually inserting and removing data cartridges.

Front Door

The data cartridge slots, the tape drive, and the operator panel are protected by a physically lockable door.

Internal components

Robot

The robot picks and places cartridges between the data cartridge slots and the tape drive. During normal autoloader operation, the robot responds to commands from the application software to move the cartridges between the storage slots and the drive.

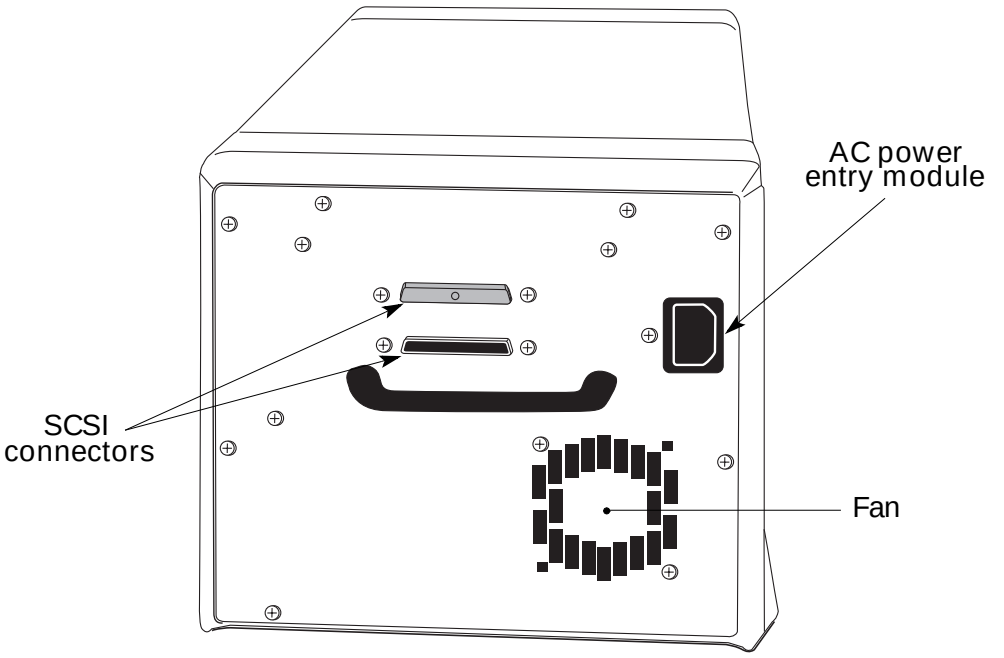
Rear data cartridge slots

Two rear data cartridge slots are located at the top of the autoloader, directly behind the top two front slots. You can place cartridges in the two rear slots by instructing the robot to pick and place data cartridges from the front data cartridge slots.

Tape drive

The autoloader includes one DLT™ 4000 or DLT™ 7000 tape drive. The tape drive is housed in a removable drive sled.

Back panel components



AC power entry module

The AC power entry module allows you to connect the autoloader to the AC power cable.

Fan

The fan reduces the autoloader's operating temperature.

SCSI connectors

The two wide SCSI connectors allow you to connect the autoloader and enclosed tape drive to a wide SCSI bus. If you have a narrow host, you can connect the autoloader to the host using a wide-to-narrow adapter. (See page 82 for SCSI adapter requirements.)

Notes

1 Installation

This chapter describes how to install and set up your autoloader.

Preparing for installation

This section provides step-by-step instructions for preparing the autoloader. You can use the table below as a checklist.

✔	Step	Description
	1	Unpack the autoloader.
	2	Obtain accessories and equipment.
	3	Prepare the host computer.
	4	Prepare the autoloader for installation.

Step 1 – Unpack the autoloader

Unpacking the autoloader involves lifting the autoloader out of the box and removing the packing material. Save all the original packing materials, including the accessory box, in case you need to ship or move the autoloader later.

CAUTION

To avoid damaging the autoloader and voiding your warranty, be sure to use the original carton, accessory box, and shipping materials (or replacement materials obtained from your vendor) when repacking and shipping the autoloader.

Step 2 – Obtain accessories and equipment

Make certain you have all the accessories and equipment for autoloader operation, as indicated in the table below.

Required accessories and equipment*	
Rack-mount hardware (rack-mount model only)	Rack-mounting hardware is included with the rack-mount model.
Data cartridges	One Exatape™ IV data cartridge may be included in the accessory kit.
Power cord	A 120 VAC power cord is included with the autoloader in the accessory kit. (Page 77 provides power cord specifications for other voltages and international use.)
SCSI cables	One wide, single-ended or differential SCSI cable may be included in the accessory kit. If you want to use your own cables, see Appendix A for specifications.
SCSI terminators	One wide, single-ended or differential SCSI terminator may be included in the accessory kit.
SCSI cable adapters (if you want to connect a narrow host to wide autoloader SCSI connectors)	See Appendix A for specifications.
Cartridge storage case (desktop and rack-mount models only)	One 14-cartridge storage case may be included in the accessory kit.
Cleaning cartridge	Use only DLT™ CleaningTape III.

* These items are available for purchase from Exabyte (see page x).

Step 3 – Prepare the host computer

Make certain the application software is compatible with the Exabyte 17D or the Exabyte 210 library. You can obtain software compatibility information about Exabyte products from Exabyte's World Wide Web site (http://www.exabyte.com).

Note: If your application only supports a DLT tape drive, you can run the autoloader in sequential mode (see page 31). If your application does not support the Exabyte 17D but does support the Exabyte 210 library, you can run the autoloader in EXB-210 emulation mode (see page 31).

You can install the software application on the host computer before or after autoloader installation. If you connect the autoloader to the SCSI bus before installing the software, the software will be configured to recognize the autoloader during installation.

Step 4 – Prepare the autoloader for installation

Prepare the autoloader as follows:

- Ensure that the work area is free from conditions that could cause electrostatic discharge (ESD). Discharge static electricity from your body by touching a known grounded surface, such as your computer's metal chassis.

- Locate an appropriate area for the autoloader. The autoloader must have a level surface near a readily accessible outlet. In addition, there must be approximately six inches (15 cm) of open area behind the autoloader for adequate air flow.

Installing the autoloader hardware

This section provides step-by-step instructions for installing the autoloader hardware. You can use the table below as a checklist.

✔	Step	Description
	1	Install the autoloader into a rack (rack-mount model only).
	2	Open the autoloader door.
	3	Remove the packing foam.
	4	Prepare and install the data cartridges.
	5	Connect the autoloader to the SCSI bus.
	6	Connect the power cord.
	7	Power on the autoloader.

WARNING!

Before performing any installation or maintenance procedures, be sure that the autoloader power switch is in the off position and that the power cord is disconnected from the autoloader and the outlet.

Step 1 – Install the autoloader into a rack

If you purchased the rack-mount model, follow the instructions starting on page 93 to install the rack-mount autoloader. If you purchased the rack add-on model, follow the instructions starting on page 99 to install a second rack-mounted autoloader.

Step 2 – Open the autoloader door

1. Untape the two keys from the back panel of the autoloader.
2. Insert a key into the door lock, push in, and rotate it clockwise one quarter turn.
3. Open the autoloader door.

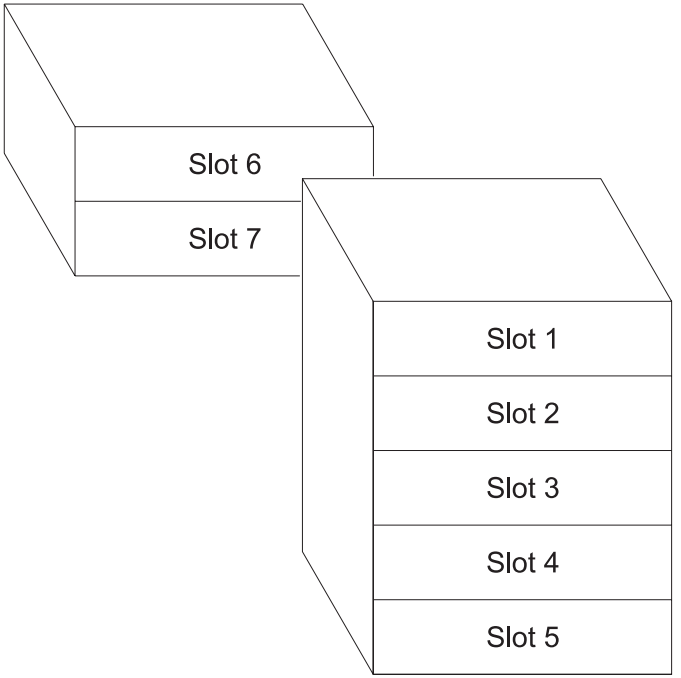
Step 3 – Remove the packing foam

From inside the autoloader, remove the foam packing piece. Save the packing piece with the other packing materials.

Step 4 – Prepare and install cartridges

Exabyte recommends that you use Exatape™IV data cartridges. You can install a total of seven data cartridges in the autoloader. Five data cartridges can be installed manually into the front slots (Slots 1 to 5). The remaining two data cartridges must be loaded by the robot into the rear slots (Slots 6 and 7).

The following figure shows the location of the data cartridge slots in the autoloader.

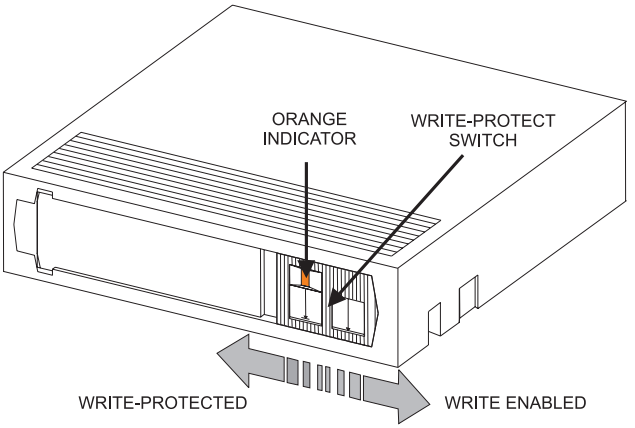


To prepare and install cartridges:

1. Make sure the write-protect switch on the cartridges is set correctly, as shown in the following figure. To do so, hold the cartridge with the label facing up and the two arrows pointing down. The write-protect switch includes both arrows and slides back and forth.

- To write protect the cartridge, slide the switch to the left. This reveals an orange rectangle above the arrow.

- To write enable the cartridge, slide the switch to the right. This hides the orange rectangle.



2. With the write protect switch on the data cartridge facing you, slide one cartridge into the top front data cartridge slot.

3. Repeat this step for the remaining four front slots.

   Note: You must power on the autoloader before loading the other two cartridges. See page 24 for information about how to perform these steps.

4. Close the front door. To lock it, turn the key one quarter turn counter-clockwise.

Step 5 – Connect the autoloader to the SCSI bus

This section provides general guidelines for connecting the autoloader to the SCSI bus. The autoloader and tape drive act as two SCSI devices on one SCSI bus.

The autoloader is equipped with wide SCSI connectors so that you can connect to a wide (68-pin) SCSI bus. If you want to connect the autoloader to a narrow SCSI bus, you can do so by using the appropriate SCSI cable adapters (see Appendix A).

Before you begin

1. Make sure the host computer and any peripheral devices are powered off.

> **CAUTION**
>
> To avoid damaging the tape drive, make sure the autoloader is powered off when you connect it to the SCSI bus.

2. If you are unfamiliar with connecting devices on a SCSI bus, read Appendix B before connecting the autoloader to the bus.

Connecting the Exabyte 17D

The Exabyte 17D has two SCSI connectors, located on the back panel. To connect the autoloader to the bus:

1. Connect a SCSI cable to either connector. Use appropriate SCSI adapters, if necessary.

2. If the autoloader is the last device on the SCSI bus, install a terminator on the unused connector. Or, if the autoloader is not the last device on the bus, connect a SCSI cable from the unused SCSI connector to the next device on the bus.

   Note: SCSI bus termination power is supplied by the robotics interface, not by the drive.

Step 6 – Connect the power cord

> ➤ **Important** The power cord shipped with the autoloader is a 120 VAC three-conductor power cord for use in the United States and Canada. If you are planning to use an input voltage other than 120 volts AC or if you plan to use the autoloader outside of the United States or Canada, you must supply your own power cord. Refer to page 77 for more information.

1. Make sure that the power is off (the LEDs are not illuminated on the front panel).

2. Connect the female end of the power cord to the power connector on the back of the autoloader.

3. Plug the male end of the power cord into the power source.

   Note: The autoloader has autoranging voltage selection, so you do not need to change the voltage setting.

Step 7 – Power on the autoloader

1. Power on the host computer system.

   Note: If your host system requires that attached peripheral devices be powered on before the host, power on the autoloader before you power on the host.

2. Press the POWER button on the front panel of the autoloader.

Wait while the autoloader performs its power-on sequence. During this time, the following activities occur:

- The cooling fan begins to rotate.
- The LCD illuminates and displays the initialization sequence.
- The autoloader and the tape drive perform their power-on self-tests.
- The autoloader builds a cartridge inventory and calibrates the robot.
- The LCD displays the initial status screen (Ready mode).

If problems occur . . .

If the autoloader does not power on as described:	Check the following: ▪ Is the power on? ▪ Is the power cord inserted correctly? ▪ Is the SCSI bus terminated? ▪ Is the SCSI cable connected to the autoloader and host computer? ▪ Is the host computer system powered on? For additional troubleshooting tips, see "Problems with autoloader installation and operation" on page 72.
If an error code is displayed on the LCD:	See Appendix C for a list of error codes and corrective actions.
If you cannot solve the problem yourself:	Contact your service provider or Exabyte Technical Support.

Notes

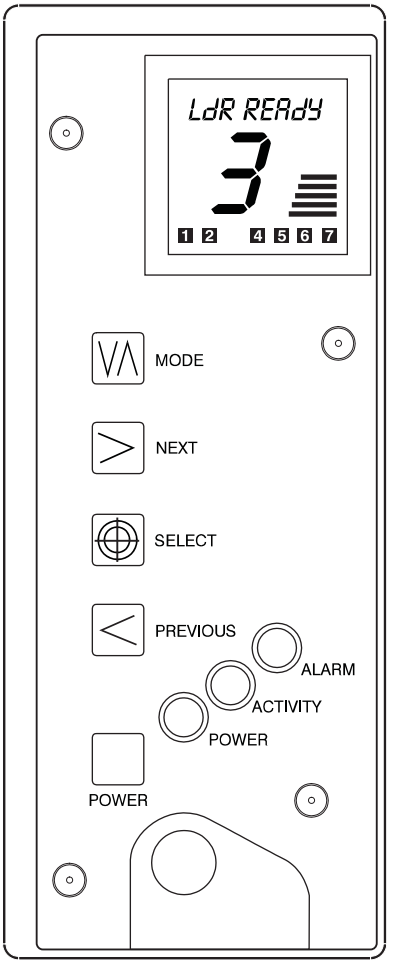
2 Configuration

After installing the hardware, you need to configure the autoloader for operation. Configuration steps include:

- Using the operator panel
- Loading data cartridges in the rear slots
- Setting configuration options
- Checking the setup

Using the operator panel

The autoloader includes an LCD, keypad, and LEDs, called the *operator panel*, which allows you to interactively control autoloader operations. Using the operator panel, you can set autoloader options, check operating statistics, and diagnose errors, as shown in the following figure.



Operator panel LCD

The LCD provides information about the operating status of the autoloader. The first line of the LCD contains a status message. The following example shows an initial status message, LDR READY, which indicates that the autoloader is ready to operate. (If an error has occurred during operation, an error message appears on this line.)

The LCD also provides information about the data cartridges and the tape drive, as follows:

- **DC** indicates that data compression is selected on the drive.
- **WP** indicates that a write-protected data cartridge is loaded into the drive.
- **CT** indicates that the tape drive needs to be cleaned.

The large numeric field in the center of the LCD shows the slot number of the cartridge that is currently loaded in the tape drive. Up to seven numeric fields appear at the bottom of the LCD to indicate the current cartridge inventory. Each field appears only if a cartridge is present in the corresponding storage slot.

Activity bars, located on the right side of the LCD, flash to indicate autoloader robot and tape drive activity, as follows:

- **Single bar (slow-blinking interval).** This bar appears when no autoloader activity is taking place.
- **Multiple bars (slow-blinking interval).** A slow-blinking interval between the activity bars indicates robot activity
- **Multiple bars (fast-blinking interval).** A fast-blinking interval between the activity bars indicates tape drive activity.

Operator panel keys

The following table describes the function of the operator panel keys.

MODE	Scrolls through the menu options.
NEXT	Goes to the next option available within a given mode.
PREVIOUS	Goes to the previous option available within a given mode.
SELECT	Executes the selected option.
POWER	Powers the autoloader on and off.

Operator panel LEDs

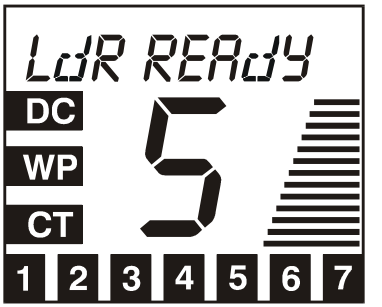
The operator panel also features three LEDs that allow you to view autoloader status, as follows:

- **Power (green).** The Power LED illuminates when the autoloader is powered on.
- **Activity (blinking amber).** The Activity LED flashes during robot and tape drive activity. A slow-blinking interval indicates robot activity, and a fast-blinking interval indicates tape drive activity.
- **Alarm (red).** The Alarm LED indicates that an error has occurred during autoloader operation.

Status screen

The initial status screen appears when you apply power to the autoloader. Depending on the operation mode you select, the screen message indicates that the robot is ready to pick or place a selected data cartridge (LDR READY) or that the robot is ready to operate in sequential mode (SEQ READY).

An example of the initial status screen is shown in the following figure.



Error codes

If a hardware error occurs, an error code appears automatically on the LCD. An E appears in the field where the cartridge number is normally displayed, and an error message appears on Line 1 of the display.

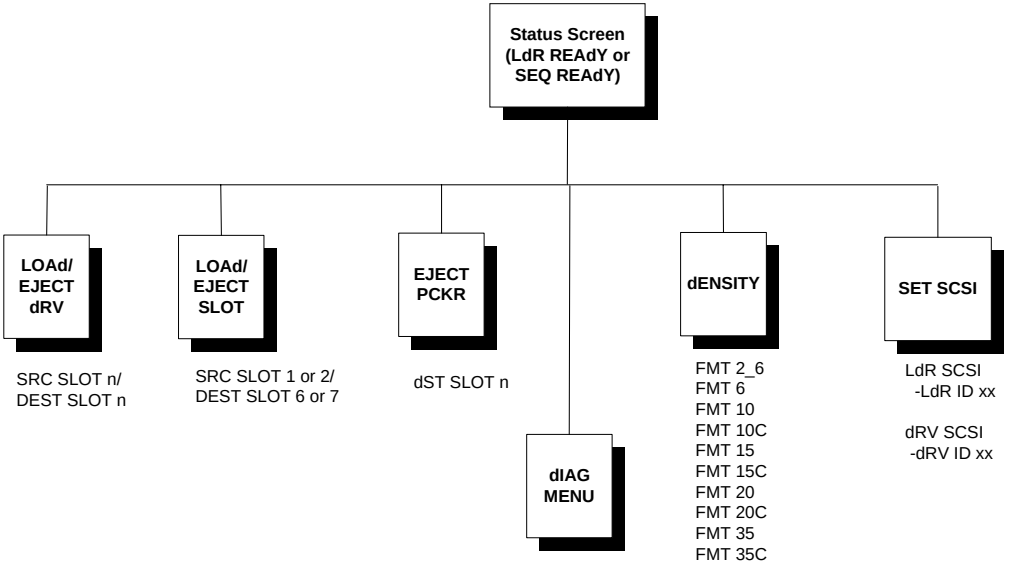
The error message provides the error's numerical code. You must correct the error before autoloader operation can continue. (Refer to Appendix C for help in diagnosing and correcting errors.)

Menu structure

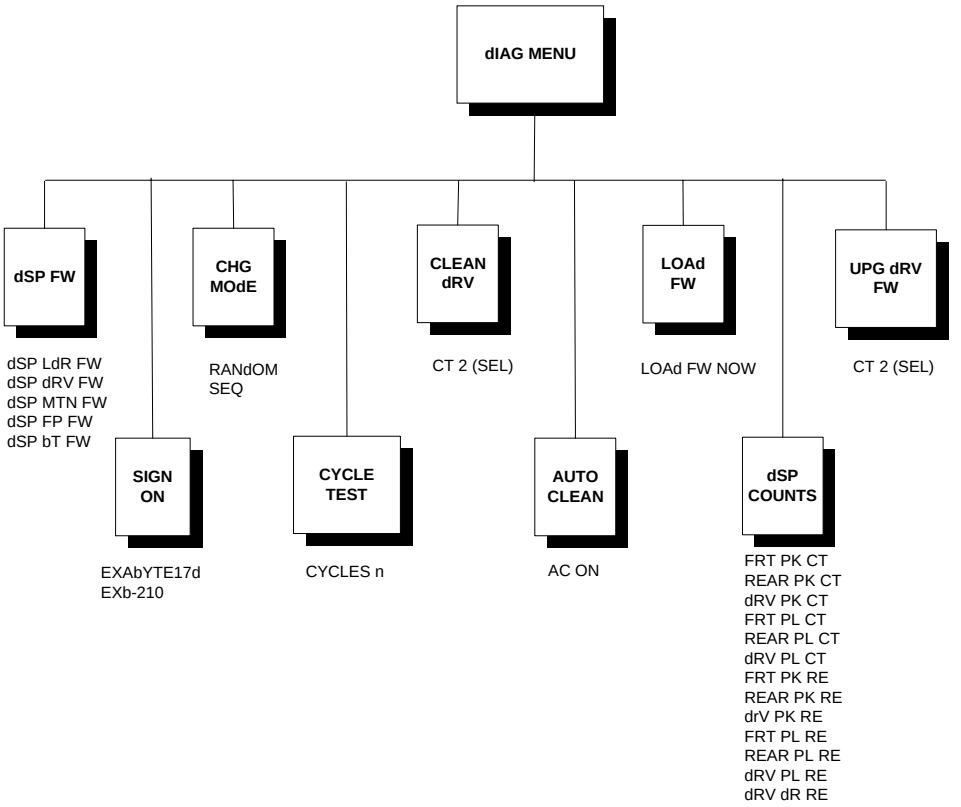
The menu selections available from the LCD are described in the following table.

Mode	Description
LDR READY	These modes indicate that the autoloader is ready to accept commands. You can press the MODE key from either of these screens to view other mode options, or you can press the NEXT and MODE keys simultaneously to go to the Diagnostics Menu.
SEQ READY	
STOP SEQ	Use this mode to stop a sequential operation so that you can replace data cartridges and then resume sequential operation.
EJECT DRV	If a data cartridge is loaded in the tape drive, use this mode to eject the cartridge.
LOAD SLOT	If one of the rear slots (Slot 6 or Slot 7) is empty, use this mode to instruct the robot to load a data cartridge into the slot. See page 24 for information about this option.
EJECT SLOT	If one of the rear slots is full (and Slot 1 or 2 in front is empty), use this mode to instruct the robot to move a cartridge from Slot 6 to Slot 1, or from Slot 7 to Slot 2.
EJECT PCKR	Use this mode to move a data cartridge from the robot to a data cartridge slot.
DENSITY	Use this mode to change the tape density.
SET SCSI	Use this mode to set the SCSI ID for the tape drive and the autoloader. See page 28 for information about setting SCSI IDs.

The following figure shows the Main Menu structure.

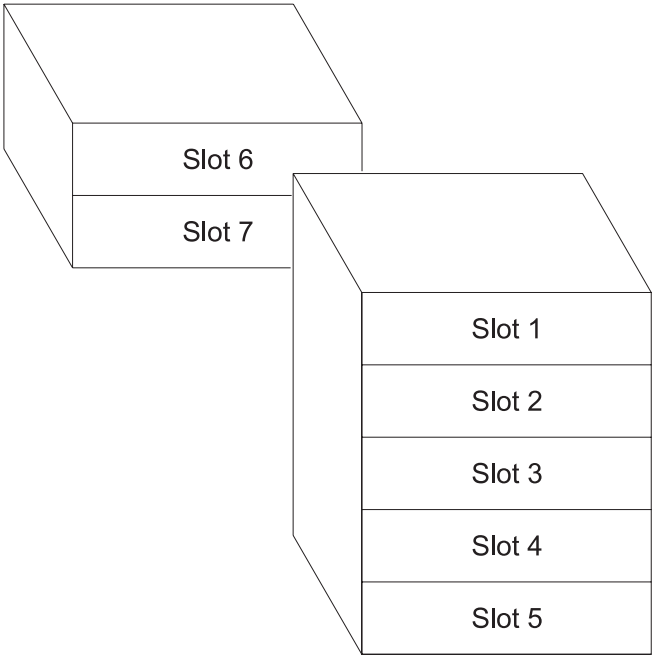


The following figure shows the Diagnostics Menu structure.



Loading data cartridges in the rear slots

After the autoloader has completed its power-on self-test, you can install data cartridges in the rear data cartridge slots. These slots, called Slot 6 and Slot 7, are located in the rear of the autoloader, as shown in the following figure.



Alternatively, you can install a cleaning cartridge in Slot 7 for automatic tape drive cleaning. See page 43 for information about tape drive cleaning options.

Using the LOAD SLOT command, you can instruct the robot to load Slot 6 and Slot 7 from Slot 1 and Slot 2.

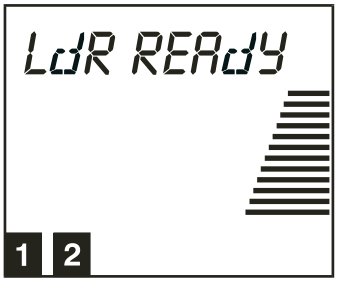
WARNING

Do not attempt to manually insert or remove cartridges through the front of the autoloader to or from the rear data cartridge slots. Doing so may cause personal injury.

➤ **Important** The LOAD SLOT command always moves cartridges from Slot 1 to Slot 6, and from Slot 2 to Slot 7.

To load Slot 6 and Slot 7 from Slots 1 and 2:

1. From the initial status screen (LDR READY), make sure the LCD verifies that Slot 1 and Slot 2 contain data cartridges, as shown in the following figure. (Make sure that the numbers 1 and 2 appear in the lower left area of the display.)



2. Press the MODE key twice. The LOAD SLOT screen appears.

Note: If Slots 1 and 2 are empty, the LOAD SLOT screen does not appear.

3. Press SELECT. The SRC SLOT *n* option appears, where *n* corresponds to Slot 1 or Slot 2.

4. To move a data cartridge to the first rear slot (Slot 6), press SELECT.

The autoloader moves the data cartridge from Slot 1 to Slot 6. When the autoloader has completed the command, the LDR READY screen appears.

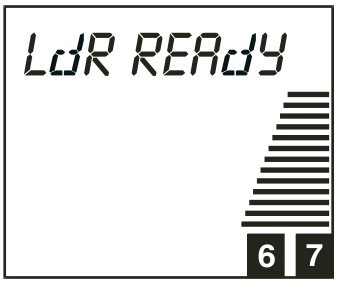
5. To move a data cartridge to the second rear slot (Slot 7), repeat steps 2 and 3. Then, press SELECT to move the remaining data cartridge from Slot 2 to Slot 7.

Note: If you want to enable the Autoclean option, you need to install a cleaning cartridge in Slot 7 (see page 46).

The autoloader moves the data cartridge to Slot 7. When the autoloader has completed the command, the LDR READY screen appears.

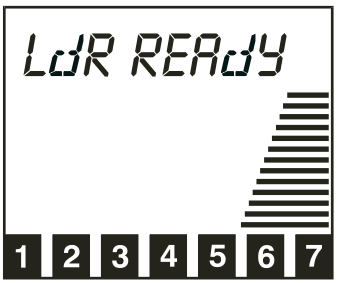
To verify that the data cartridge installation is complete:

1. Make sure the LCD shows that Slots 6 and 7 are full, as shown in the following figure. (The numbers 6 and 7 should appear in the lower right area of the display.)



2. Unlock and open the autoloader door and manually insert data cartridges into the front slots (Slots 1 through 5).

3. Make sure the LCD shows that all the slots contain data cartridges, as shown in the following figure.



Setting configuration options

Configuration steps include:

- Setting the SCSI IDs
- Setting the EXB-210 emulation (if necessary)
- Setting robot control mode (random or sequential)
- Setting other configuration options (if necessary)

Step 1 – Set the SCSI IDs

Default SCSI IDs are assigned at the factory for the autoloader and the tape drive. This section describes how to view the default settings and change them if necessary.

> ➤ **Important** The autoloader and tape drive must each have a unique SCSI ID within the SCSI bus. The default SCSI ID for the autoloader is 1, and the default SCSI ID for the tape drive is 3.

To set the SCSI ID for the autoloader:

1. If the current settings work with your SCSI bus, go to "Step 2 – Set Emulation." If you want to change the current settings, press the MODE key several times until SET SCSI appears on the LCD.

2. Press SELECT. The LDR SCSI command appears on the screen.

3. Press SELECT. LDR ID *n* (where *n* is the current SCSI ID of the autoloader) appears on the LCD.

4. Press NEXT to select a higher ID or PREVIOUS to select a lower ID.

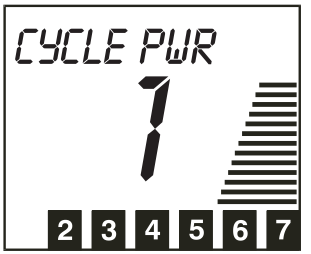
5. Press SELECT to accept the new ID for the autoloader.

To set the SCSI ID for the tape drive:

1. From the DRV SCSI screen (the screen that appears after you have selected the autoloader SCSI ID), press SELECT. DRV ID *n* (where *n* is the current SCSI ID of the tape drive) appears on the LCD.

2. Press NEXT to select a higher ID or PREVIOUS to select a lower ID.

3. Press SELECT to accept the new ID for the tape drive. A blinking CYCLE PWR message appears on the LCD for approximately 10 seconds.



4. Press and hold the POWER key for a minimum of 2 seconds to power down the autoloader.

➤ **Important** You must power cycle the autoloader for the new SCSI IDs to take effect. You may need to power cycle the host as well.

5. Press POWER again to power up the autoloader. The new SCSI IDs are now in effect.

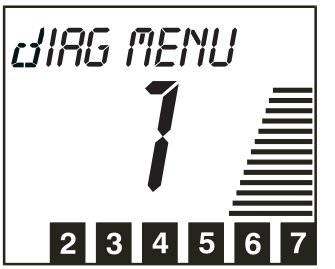
Step 2 – Set Emulation

Use emulation if your application software does not support the Exabyte 17D and does support the Exabyte 210 library. When emulation is on, the autoloader returns "EXB-210" in response to a SCSI INQUIRY command. This allows you to use most (but not all) application software packages that provide a driver for the Exabyte 210 library but not for the Exabyte 17D autoloader.

To set the autoloader to Exabyte 210 emulation mode:

1. From the LDR READY screen, press the NEXT key first and then the MODE key so that you are pressing them both simultaneously.

2. Press both keys for approximately five seconds until the DIAG MENU screen appears:



3. Press the MODE key twice. The SIGN ON screen appears.

4. Press SELECT. The EXABYTE 17D screen appears.

5. Press NEXT. The EXB-210 screen appears.

6. Press SELECT.

Step 3 – Set robot control mode

Robot control mode refers to the interface used to control the motion of the robot. The robot control modes are listed below:

- Random (SCSI)
- Sequential

Each of these control modes is described in the following pages. Refer to page 32 for instructions on changing the robot control mode.

Note: Robot control mode settings remain through power cycles.

Random (SCSI) If you want the application software to control autoloader operations, you must set the autoloader to Random mode. In this standard operating mode, the application software controls the motion of the robot by issuing SCSI commands across the SCSI bus.

Note: The application software can issue commands to the autoloader regardless of the robot control mode. However, the autoloader must be in Random mode for the application software to control the robot's motion.

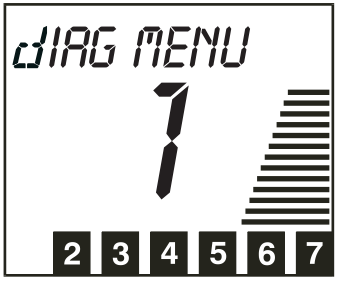
Sequential If you want the autoloader to run as a sequential stacker device, you need to set the autoloader to sequential mode. In this mode, the application software does not need to provide support for autoloader functions, only for the tape drive.

Setting the robot control mode

Follow these steps to change the robot control mode.

1. From the LDR READY screen, press the NEXT key first and then the MODE key so that you are pressing them both simultaneously.

2. Press both keys for approximately five seconds until the DIAG MENU screen appears:



3. Press the MODE key three times until the CHG MODE screen appears.

4. Press SELECT. The current operating mode appears (RANDOM or SEQUENTIAL).

5. To select an alternative operating mode, press NEXT; then press SELECT. A CYCLE PWR message appears.

6. Press the POWER key for several seconds to power down the autoloader.

7. Press the POWER key again to resume power in the new operating mode.

➤ **Important** Whenever you change operating modes, you must power cycle the autoloader.

Checking the setup

After installing the hardware and software, check the setup by performing some exercises on the autoloader, as described below. (While these exercises are not required, it is a good idea to verify that your software and hardware are properly communicating before you begin operations.)

- Use the Cycle Test option to exercise the hardware. This determines whether the autoloader hardware components are operating properly. See page 68 for more information about this option.

- Instruct the application software to load and unload cartridges into the tape drive. This determines whether the software and autoloader are communicating properly.

- Back up several megabytes of data and perform a comparison check on the backed up data. This determines whether the software and tape drive are communicating properly.

If problems occur . . .

If the autoloader and tape drive are not operating as expected:	See Chapter 8 for troubleshooting information.
If an error code appears on the LCD:	See Appendix C for a list of error codes and corrective actions.
If you cannot solve the problem yourself:	Contact your service provider or Exabyte Technical Support.

Where to go from here

Before you begin autoloader operations, check the following:

- ✔ The tape drive does not have a cartridge loaded.
- ✔ The robot does not contain a cartridge.
- ✔ The data cartridge slots are full.
- ✔ The autoloader is in the proper control mode. The standard operating mode is Random (see page 31).

3 Autoloader Operation

Once the autoloader and application software are installed and configured, you can automatically perform backup and restore operations using the application software. You do not need to intervene in the cartridge processing during normal autoloader operations.

This chapter describes autoloader operations you may occasionally need to perform:

- Replacing data cartridges
- Ejecting a data cartridge from the robot
- Resetting the autoloader

Replacing data cartridges

This section describes how to:

- Select the appropriate data cartridges for your tape drive
- Remove and replace single data cartridges
- Store cartridges outside the autoloader

Selecting data cartridges

Exabyte recommends that you use Exatape™ DLTtape™ IV data cartridges. Exatape media meets specifications that are the most stringent in the industry.

When used in a DLT 7000 tape drive, a single Exatape IV Data Cartridge provides 35 gigabytes (GB) native storage capacity and 70 GB with 2:1 data compression. When used in a DLT 4000 tape drive, an Exatape IV Data Cartridge provides 20 gigabytes (GB) native storage capacity and 40 GB with 2:1 data compression.

Accessing and replacing data cartridges

To access or replace the cartridges, follow these steps:

1. To replace data cartridges in the front slots of the autoloader (Slots 1 through 5), unlock and open the autoloader door to replace the cartridges manually.

➤ **Important** Make sure the LDR READY (Random mode) or the SEQ READY (Sequential mode) message is displayed on the LCD before removing or inserting data cartridges.

To unload Slots 6 and 7 in the rear of the autoloader, use the EJECT SLOT command. The EJECT SLOT command always moves cartridges from Slot 6 to Slot 1, and from Slot 7 to Slot 2.

To unload data cartridges from Slots 6 and 7:

1. Make sure Slots 1 and 2 are empy. If Slots 1 and 2 contain data cartridges, unlock and open the autoloader door to remove them.

   ➤ **Important** If you need to place the cartridges back in Slots 1 and 2 after completing this procedure, make sure to mark them accordingly.

2. When you have verified that Slots 1 and 2 are empty, press the MODE key until the EJECT SLOT screen appears.

   Note: If Slots 1 and 2 contain data cartridges, the EJECT SLOT option does not appear.

3. Press SELECT.

4. To unload Slot 6, press SELECT again.

5. To unload Slot 7, press SELECT. When the move from Slot 6 to Slot 1 is complete, repeat steps 2 to 4.

   Note: If Slot 6 or Slot 7 is already empty, a blinking RESELECT message appears on the LCD, indicating that you attempted to make an invalid selection.

6. After the cartridges have been picked from Slots 6 and 7 and placed in Slots 1 and 2, unlock and open the autoloader door to remove them.

To replace the data cartridges in Slot 6 and Slot 7:

1. Make sure the write-protect switches on the replacement cartridges are set correctly for the desired operation. (If the orange tab is showing, the cartridges are write-protected.)

2. Hold the cartridge so that the write-protect switch faces you. Unlock and open the autoloader door to insert replacement cartridges into Slots 1 and 2.

3. Press the MODE key until the LOAD SLOT message appears.

4. To load a cartridge from Slot 1 to Slot 6, press SELECT.

5. After Slot 6 is loaded, you can load Slot 7 by repeating step 3 and then pressing SELECT.

6. When the robot has moved both cartridges from Slots 1 and 2 to Slots 6 and 7, you can return the original cartridges to Slots 1 and 2, or replace them with new cartridges.

   Note: Although the autoloader does not require all seven data cartridges to operate, installing seven cartridges maximizes your data storage capacity.

   Alternatively, you can use one of the cartridge slots to permanently store a cleaning cartridge (see page 46).

Storing data cartridges

To maximize the shelf life of your tapes and ensure data integrity, follow these guidelines when storing cartridges:

- **Store cartridges in a suitable environment**. Follow the specifications for storage temperature and other environmental requirements, as described on the cartridge packaging. Do not allow the temperature and humidity in the storage environment to fluctuate.

- **Keep the storage location as free of airborne particulates as possible**. To eliminate obvious sources of particulates, do not permit anyone to smoke, eat, or drink near the storage area, and do not store cartridges near a copier or printer that may emit toner and paper dust.

- **Store cartridges with the write-protect switch in the protected position**. See page 6.

- **Store cartridges as soon as possible** after you remove them from the autoloader. Immediate storage helps avoid many of the conditions that can damage tapes, such as temperature and humidity fluctuation, particulate contamination, and excessive handling.

- **Store cartridges in the storage case**. In the cartridge storage case, cartridges are protected from airborne contaminants by a plastic cover.

Ejecting a data cartridge from the robot

If you power down the autoloader while the robot is moving a data cartridge, the cartridge remains on the robot platform. You must eject the cartridge before resuming normal autoloader operations.

To eject a data cartridge from the robot:

1. From the LDR READY or the SEQ READY screen, press the MODE key until the EJECT PCKR message appears.

2. Press SELECT.

3. Use the NEXT or PREVIOUS button to scroll through the destination slot choices until the destination slot you want is displayed.

4. Press SELECT.

Resetting the autoloader and tape drive

If the autoloader or tape drive has encountered an error and is still not operating after you have tried the corrective action for the error, you may need to reset the autoloader. A reset causes the autoloader and the enclosed tape drive to perform their power-on self-tests.

> **CAUTION**
>
> Before resetting the autoloader and tape drive, make sure that neither are communicating across the SCSI bus. Resetting the autoloader and tape drive may disrupt communications on the SCSI bus.

Note: The autoloader, tape drive, or the entire SCSI bus can also be automatically reset by the host.

To reset the autoloader and tape drive:

1. Press the POWER key on the operator panel.

   Note: You must hold the POWER key for at least two seconds before the power-off cycle goes into effect.

2. Once the amber Activity LED begins flashing, you can release the POWER key, and the autoloader will power off.

When the autoloader and tape drive are reset, they perform their power-on self-tests. Then the initial status screen appears on the LCD.

➤ **Important** If the autoloader is performing a cartridge move operation when it is reset, you must use the PCKR EJECT command to move the cartridge to a slot or the drive after you power-on the autoloader again. See page 40 for information about this command.

4 Tape Drive Operation

The application software automatically controls the tape drive to perform backup and restore operations. You do not need to intervene in the cartridge processing; however, you may need to perform the following tasks:

- Clean the tape drive
- Display information about the tape drive
- Load or eject a cartridge manually

Note: You cannot control the tape drive from the operator panel; however, you can perform firmware upgrades and diagnostics on the tape drive across the SCSI port. (See page 67 for information about diagnostics.)

Cleaning the tape drive

You should clean the tape drive whenever the CT message appears on the LCD or whenever your application software notifies you. (Not all software applications display cleaning requirements.) Regular cleaning helps ensure that the tape drive functions reliably.

Even if your software does not notify you that the tape drive needs cleaning, you can enable the Autoclean option in the autoloader. When Autoclean is enabled, the autoloader automatically cleans the tape drive when necessary as long as a cleaning cartridge is stored in Slot 7.

You can clean the tape drive in one of three ways:

- Allow the software to automatically perform tape drive cleaning (if your software supports this feature)
- Enable the Autoclean option
- Clean the tape drive manually

➤ **Important** If your software application automatically performs tape drive cleaning or if you want to use the Autoclean option, you must permanently store a cleaning cartridge in Slot 7.

The following table describes conditions you may encounter when you are cleaning the tape drive.

Condition	Description	Corrective action
The CT message appears when powering on the autoloader.	The tape drive needs cleaning. If you have enabled the Autoclean option, the cleaning cartridge may need to be replaced.	Use the cleaning cartridge to manually clean the tape drive.
The CT message reappears after you have cleaned the tape drive.	The cleaning cartridge needs to be replaced.	Replace the cleaning cartridge, and clean the tape drive again. If the message persists, contact your service provider.
Loading a data cartridge into the tape drive causes the CT message to appear on the LCD.	The data cartridge may be damaged.	Contact your service provider.

Selecting cleaning cartridges

Use only DLT™ CleaningTape III. To order cleaning cartridges, contact Exabyte (see page x).

The cleaning cartridge includes a label with 20 small boxes printed on it. The cartridge should be replaced after 20 cleanings.

If you clean the tape drive manually, place a check mark in one of the boxes each time you clean the tape drive. If you enable the Autoclean option, replace the cleaning cartridge when the CT message reappears after you have cleaned the tape drive.

CAUTION

The cleaning cartridge is considerably more abrasive to the drive's recording head than standard data cartridges. Do not clean your tape drive unless the CT message indicates that it needs to be cleaned.

Enabling the Autoclean option

If your software does not support automated tape drive cleaning but you want the tape drive to be cleaned automatically, you can enable the Autoclean option.

➤ **Important** When you enable the Autoclean option, you must permanently store the cleaning cartridge in Slot 7.

To enable the Autoclean option:

1. From the LDR READY or SEQ READY screen, make sure that Slot 7 is empty. If necessary, eject the data cartridge from Slot 7 (see page 36).

2. Press the MODE key and the NEXT key simultaneously until the DIAG MENU screen appears.

3. Press the MODE key until the AUTOCLEAN screen appears.

4. Press SELECT. The AC ON screen appears.

5. Press SELECT. The CT 2 (SEL) screen appears.

6. Insert a cleaning cartridge into Slot 2. Press SELECT to instruct the robot to move the cleaning cartridge to Slot 7.

➤ **Important** If you do not place the cleaning cartridge in Slot 2 and press SELECT within 30 seconds, the autoloader will return to Ready mode and the Autoclean option will not be enabled.

Using the CLEAN DRV option

If you want to clean the tape drive manually, you can do so by using the CLEAN DRV option.

1. From the LDR READY or SEQ READY screen, insert a cleaning cartridge into Slot 2.

➤ **Important** When using the CLEAN DRV option, you must place the cleaning cartridge in Slot 2.

---

2. Make sure the tape drive does not contain a data cartridge (see page 50).

3. Once you have determined that the tape drive is empty, press the MODE key until the CLEAN DRV screen appears on the LCD.

4. Press SELECT to initiate the tape drive cleaning.

   After the robot picks the cleaning cartridge from Slot 2 and places it in the tape drive, a CLEANING message appears on the LCD. After the tape drive cleaning is complete, the robot automatically moves the cleaning cartridge back to Slot 2.

5. Remove the cleaning cartridge from Slot 2 in the autoloader. Replace it with a data cartridge.

6. Log the cleaning on the cleaning cartridge.

7. Confirm that the cleaning was done by looking at the autoloader's LCD. (The CT message should be gone.)

   If the CT message still appears on the LCD, see page 45 for troubleshooting suggestions.

Loading a cartridge into the tape drive

You may need to load a data cartridge into the tape drive if you are performing the following operations:

- Restoring data from a cartridge that is not part of the current inventory
- Performing diagnostics on the tape drive

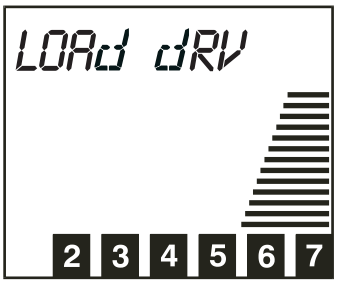
WARNING

Do not attempt to manually insert or remove cartridges through the front of the autoloader to or from the tape drive. Doing so may cause personal injury.

To load a data cartridge into the tape drive:

1. Make sure the tape drive does not contain a data cartridge (see page 50).

2. Once you have determined that the tape drive is empty, press the MODE key until the LOAD DRV option appears.

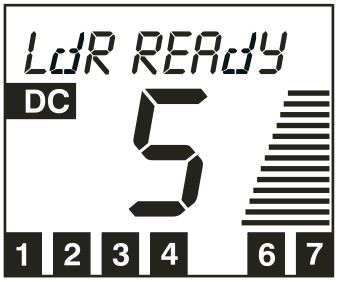


3. Press SELECT. The SRC SLOT *n* screen appears, where *n* corresponds to the first available data cartridge slot number.

4. Use the NEXT and PREVIOUS keys to scroll through the slot number options.

5. Press SELECT when the slot you want to load is displayed.

After the robot places the data cartridge into the drive, it automatically returns to Ready mode. The slot number of the cartridge in the drive is displayed in the center of the LCD, as shown in the following figure.



Ejecting a cartridge from the tape drive

If a problem occurs that requires intervention, you may need to manually eject a cartridge from the tape drive, as follows:

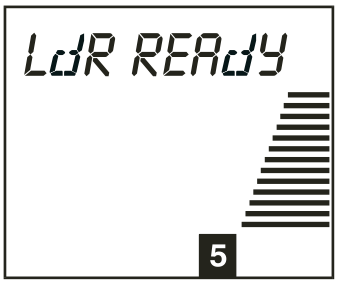
1. Look at the center of the LCD to see which slot the data cartridge was originally picked from. When you instruct the robot to unload the tape drive, it will automatically move the data cartridge to this slot as the slot is empty. The following example shows that the tape drive contains a data cartridge from Slot 5.

2. Press the MODE key until the EJECT DRV message appears on the LCD.

3. Press SELECT to eject the cartridge from the tape drive.

   The tape drive ejects the cartridge, and the robot returns the cartridge to the slot from which it was picked.

   The center of the LCD should now appear blank, as shown in the following figure. When the autoloader has completed the procedure, it automatically returns to Ready mode.



Setting the tape density format

All previously unformatted Exatape DLTtape data cartridges can be formatted to the densities shown in the following table.

Drive Model	Data Cartridge	Cartridge Density (native mode)	Cartridge Density (compressed mode)
DLT 4000	DLTtape III DLTtape IIIXT DLTtape IV	2.6, 6, 10 GB 2.6, 6, 10, 15 GB 2.6, 6, 10, 15, 20 GB	20 GB 20, 30 GB 20, 30, 40 GB
DLT 7000	DLTtape III DLTtape IIIXT DLTtape IV	2.6, 6, 10 GB 2.6, 6, 10, 15 GB 2.6, 6, 10, 15, 20, 35 GB	20 GB 20, 30 GB 20, 30, 40, 70 GB

Note: Unless you change the tape density, the autoloader reads the data cartridge at its factory default density setting.

CAUTION

Changing tape density causes the tape to be reformatted. Any previously recorded data will be lost.

To change the tape density:

1. Insert the data cartridge you want to format into an empty cartridge slot.

2. Load the tape drive with the cartridge (see page 48).

3. From the LDR READY or SEQ READY screen, press the MODE key until the DENSITY screen appears.

4. Press SELECT.

5. Use the NEXT and PREVIOUS keys to scroll through the density setting options (see page 52 for a list of these options).

6. When you reach the format density you want, press SELECT.

When the autoloader has completed the tape reformatting, it automatically returns to Ready mode.

Notes

5 Routine Service

This chapter describes the following:

- Cleaning requirements for the autoloader
- Using touch-up paint on the housing

Cleaning requirements

➤ **Important** To protect the internal components from dust, keep the autoloader door closed.

You can clean the outside of the enclosure with a damp towel.

➤ **Important** If you use a liquid all-purpose cleaner, apply it to the towel. Do not directly spray the enclosure.

The only internal autoloader component that needs to be cleaned is the tape drive. Instructions for cleaning the tape drive are provided on page 43.

CAUTION

The autoloader's internal components are lubricated at the factory and should not be cleaned or relubricated.

Using touch-up paint on the housing

A pearl-white paint kit is available for touching up nicks and scratches on the finish. For ordering information, see page x.

6 Shipping the Autoloader

This chapter describes procedures for:

- Returning the autoloader for service
- Packing the autoloader

Returning the autoloader for service

If you need to return the autoloader to the factory for service, contact your service provider. If your service provider instructs you to return the autoloader directly to Exabyte, contact Exabyte Service to obtain a Return Materials Authorization (RMA) number and the shipping address (see page x). When you have the RMA number, follow the packing instructions on the following pages.

Packing the autoloader

Use the original packing materials to pack the autoloader (shipping container, foam packing piece, and antistatic bag). You will also need packing tape.

> **CAUTION**
>
> To avoid damaging the autoloader and voiding your warranty, be sure to use the original shipping materials (or replacement materials obtained from your vendor) when repacking and shipping the autoloader. Do not use the shipping carton and packing materials to ship items other than an autoloader.

Preparing the autoloader for shipping

To prepare the autoloader for shipping:

1. Make sure the tape drive does not contain any data cartridges. (See page 50.)
2. Remove all cartridges from the data cartridge slots. (See page 36.)
3. Power off the autoloader.
4. Remove the power cord, the SCSI cables, and terminator. Do not ship these items if you are returning the autoloader to the factory.

5. If you have a desktop autoloader, go to step 6. If you have a rack-mount autoloader, remove the autoloader from the rack as follows:

   - From the front of the autoloader, release the front bracket captive thumbscrews by rotating them counterclockwise.

   - Slide the autoloader forward until the rails stop at their spring slips. Using two people, press the spring clips to disengage the rails and lift the autoloader out of the rack.

6. Open the autoloader door and push down firmly on the foam packing piece to wedge it under the robot. Make sure you push the foam piece far enough back that it does not interfere with closing the autoloader door.

7. Close and lock the autoloader door. Remove the key.

Packing the autoloader

Pack the autoloader as follows:

1. Place the antistatic bag over the autoloader.

2. If you have a desktop autoloader, place one foam cap over each end of the autoloader. (The front foam piece has a curved surface.)

   If you have a rack-mount autoloader, place two foam pieces over each end of the autoloader (two top pieces and two bottom pieces).

3. Lower the autoloader into the shipping box, keeping it in an upright position.

4. Lay the necessary paperwork in the top of the autoloader box.

5. Place the shipping label on the box.

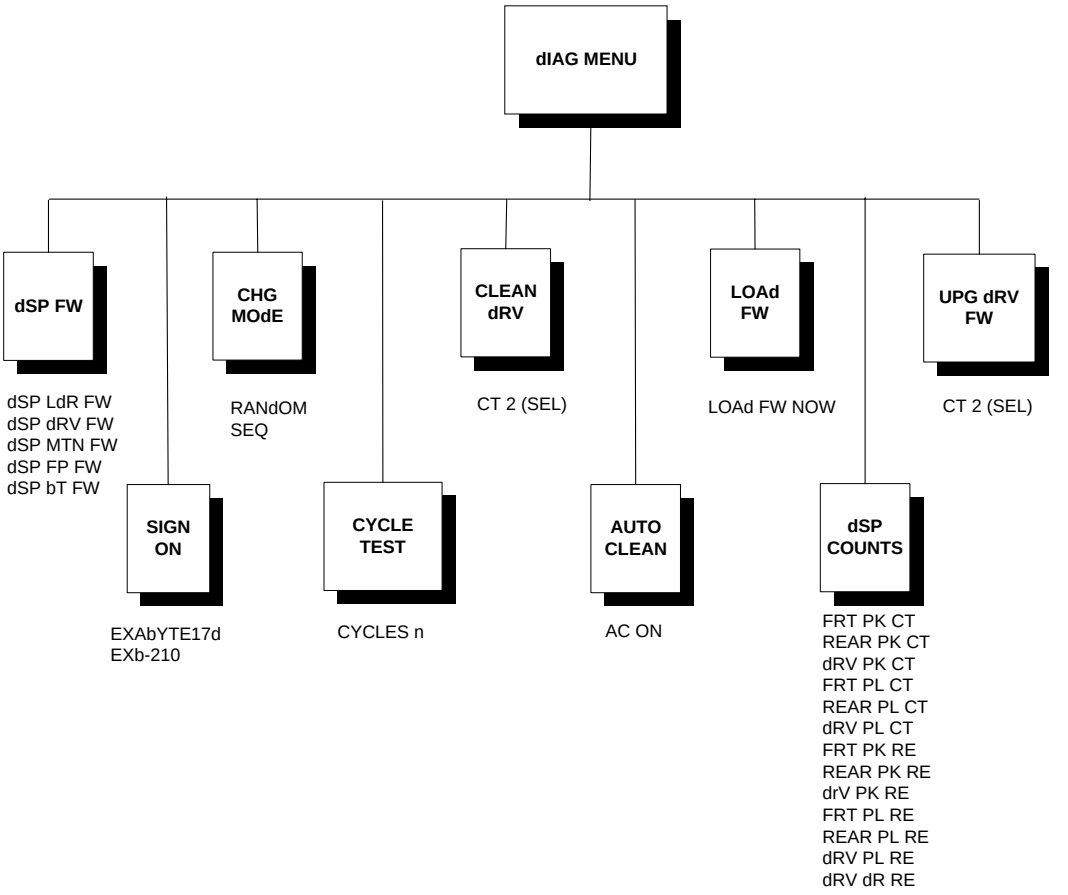
7 Advanced Operation

This chapter describes advanced operations you can perform from the operator panel:

- Viewing autoloader information, which includes code versions, system statistics, system sensors, and inventory
- Performing diagnostics on the autoloader
- Uploading new autoloader and tape drive code

Many of the tasks described in this chapter are accessed from the Diagnostics Menu. You may need to perform these tasks if you want to troubleshoot autoloader hardware operations.

The following figure shows the Diagnostics Menu structure.



Using elements

Elements are the physical locations in the autoloader that can accept a cartridge (the robot, the data cartridge slots, and the tape drive).

Element indexes

Each element has an *element index*, which enables the autoloader to identify the elements. Many LCD functions require you to use element indexes. For example, to move a cartridge you must specify the source and destination element indexes. The *source* is either the tape drive or a cartridge slot where the robot will pick a cartridge. The *destination* is either the tape drive or a cartridge slot where the robot will place the cartridge.

Element addresses

Your application software may use *element addresses* to identify elements in the autoloader. The element indexes correspond to the autoloader's default element addresses. The element addresses are displayed in the Inventory menu.

Viewing autoloader information

The functions in the Diagnostics menu are mainly for use by technical support and application developers. If you are an end user, you may be asked by technical support to display one of these screens and locate information that will help troubleshoot a problem.

This section describes the following autoloader information:

- **Code Versions.** Contains information about the flash code level and the boot code level.
- **System Statistics.** Contains information about robot operations and elements.

Viewing code versions

You can view the following information about the firmware code levels for the autoloader:

- Autoloader code (LDR FW screen)
- Tape drive code (DRV FW screen)
- Motion CPU code (MTN FW screen)
- Front panel code (FP FW screen)
- Boot code (BT FW screen)

To view the current code level of the autoloader and its components:

1. From the LDR READY or SEQ READY screen, press the MODE key and the NEXT key simultaneously until the DIAG MENU screen appears.
2. Press the MODE key once. The DSP FW screen appears.
3. Press SELECT to display the firmware code version. The DSP LDR FW screen appears.
4. Press SELECT to view the autoloader firmware code level, or use the NEXT and PREVIOUS keys to scroll through the firmware display options.

Viewing statistics

The Diagnostics menu contains a Display Counts submenu, which allows you to view how many times the robot has performed certain functions. The following table describes these functions.

Function	Description
FRT PK CT	The number of times the robot tried to pick a cartridge from a front slot (Slots 1 to 5).
REAR PK CT	The number of times the robot tried to pick a cartridge from a rear slot (Slots 6 or 7).
DRV PK CT	The number of times the robot tried to pick a cartridge from the tape drive.
FRT PL CT	The number of times the robot tried to place a cartridge in a front slot (Slots 1 to 5).
REAR PL CT	The number of times the robot tried to place a cartridge in a rear slot (Slots 6 or 7).
DRV PL CT	The number of times the robot tried to place a cartridge in the tape drive.
FRT PK RE	The number of times the robot retried picking a cartridge from a front slot (Slots 1 to 5).

Function	Description
REAR PK RE	The number of times the robot retried picking a cartridge from a rear slot (Slots 6 or 7).
DRV PK RE	The number of times the robot retried picking a cartridge from the tape drive.
FRT PL RE	The number of times the robot retried placing a cartridge in a front slot (Slots 1 to 5).
REAR PL RE	The number of times the robot retried placing a cartridge in a rear slot (Slots 6 or 7).
DRV PL RE	The number of times the robot retried placing a cartridge in the tape drive.
DRV DR RE	The number of times the robot has retried opening the tape drive door.

To view autoloader statistics:

1. From the LDR READY or the SEQ READY screen, press the MODE key and the NEXT key simultaneously until the DIAG MENU screen appears.

2. Press the MODE key until the DSP COUNTS option appears.

3. Press SELECT.

4. Use the NEXT or PREVIOUS button to scroll through the Display Counts options.

Viewing inventory information

The autoloader stores inventory information in nonvolatile RAM and uses the information to process SCSI commands from the application software. The inventory, which appears on the LCD, contains information about the following element locations:

- Cartridge slots
- Tape drive
- Robot

Performing diagnostics

This section describes how to perform diagnostics using the Cycle Test option in the Diagnostics menu. The Cycle Test option allows you to demonstrate the performance of the autoloader by having the robot randomly move cartridges between slots and the tape drive.

➤ **Important** To use the Cycle Test option, the tape drive must be empty, and all the data cartridge slots must be full.

Note: If the Autoclean option is enabled and a cleaning cartridge is stored in Slot 7, Cycle Test will not attempt to use Slot 7 during the test.

Using the Cycle Test option

1. Make sure the tape drive is empty. (No number should appear in the center of the LCD, as shown in the following figure.)

   If a number does appear in the center of the LCD, eject the cartridge from the tape drive. (See page 50.)

2. Check the LCD to make sure all the cartridge slots are full, as shown in the following figure.

   If necessary, insert data cartridges into any empty slots. (You can load the front slots manually. See page 24 for information about loading cartridges into the rear slots.)

3. From the LDR READY or the SEQ READY screen, press the MODE key and the NEXT key simultaneously until the DIAG MENU screen appears.

4. Press the MODE key until the CYCLE TEST option appears, then press SELECT.

5. Use the NEXT or PREVIOUS button to select how many times you want the test to repeat (0 to 9 cycles).

To stop the Cycle Test, press any key. The test will stop once it has completed the current cycle.

Loading firmware upgrades

You can use the SCSI connectors and a host computer to upgrade the autoloader and tape drive firmware levels. For information about uploading the most current firmware level, see Exabyte's World Wide Web site (http://www.exabyte.com).

Notes

8 Troubleshooting

This chapter provides a list of suggestions for solving problems that may occur when you are installing and operating the autoloader and the enclosed tape drive. The instructions in this chapter are basic troubleshooting guidelines. For more advanced troubleshooting, contact your service provider or Exabyte Technical Support.

This chapter is divided into the following sections:

- Problems with autoloader installation
- Problems with tape drive operation
- Problems with autoloader operation

Note: If an error code is displayed on the LCD, refer to Appendix C.

Problems with autoloader installation and operation

If your autoloader and application software are not communicating after installation, check the following:

- ✔ **SCSI IDs.** Make sure that the SCSI IDs you selected for the tape drive and autoloader are not the same as the ID used by any other SCSI device on that bus, including the SCSI adapter card. Refer to page 28 for information about setting the SCSI IDs.

- ✔ **SCSI cabling.** Make sure that all SCSI cables are securely connected at both ends.

- ✔ **Single-ended and differential devices.** Make sure all devices on the bus are all single-ended or differential. These devices include the controller cards, cables, and terminators.

- ✔ **SCSI cable lengths**. Make sure the SCSI cabling does not exceed maximum lengths (see page 80).

- ✔ **Termination**. Make sure your bus is properly terminated as described in Appendix B. If another SCSI device previously terminated the SCSI bus and is no longer at the physical end of the bus, be sure to remove the terminators from that device.

- ✔ **Compatibility.** Make sure that your tape drive and autoloader are compatible with the application software you plan to use.

- ✔ **SCSI adapter card installation.** Make sure that you installed your SCSI adapter card correctly. Refer to the documentation that came with your card for installation and troubleshooting instructions. Pay special attention to steps describing setting various jumpers and switches on the card. Make sure that the card is properly seated.

- ✔ **Software installation.** Make sure that your application software is installed correctly. Refer to the documentation that came with your software. Pay special attention to steps describing configuring the software for use with the autoloader and tape drive.

- ✔ **Control mode.** Make certain the autoloader is operating in the correct control mode. For most applications, the control mode should be set to Random (SCSI) mode. See page 31 for more information.

- ✔ **Error messages.** See Appendix C for a description of the error messages and the actions you can take to correct them.

After checking the items above, reset the autoloader as described on page 41.

Problems with tape drive operation

If you have been successfully operating the application software and autoloader in the past, but are now experiencing problems reading and writing data, check the following:

- ✔ **Write-protect switch**. If you are writing data, make sure the cartridge is write enabled (move the write-protect switch toward the edge of the cartridge).

- ✔ **Cartridge brand**. For best performance, Exabyte recommends that you use Exatape data cartridges. See page 36 for more information.

- ✔ **Cartridge age**. If the cartridge has been in use for a long time or if it has been used frequently, try using a new cartridge.

- ✔ **Cleaning**. Clean the tape drive as described on page 43. Make sure you are using the recommended cleaning cartridge for your tape drive.

A Specifications

This appendix provides general specifications for the autoloader, including:

- Storage capacities
- Overall specifications
- Power cord requirements
- SCSI cable specifications
- SCSI terminator requirements
- SCSI adapter requirements

Storage capacities

The table below summarizes the storage capacity of the autoloader (containing seven data cartridges).

Capacity with the following tape drives and cartridge types...[a]	
DLT 4000 with Exatape IV Data Cartridges	**DLT 7000 with Exatape IV Data Cartridges**
280 gigabytes	490 gigabytes

[a] Assumes that the tape drive is writing data at a 2:1 compression ratio.

Overall specifications for the autoloader

General specifications	
Interface:	SCSI-2 (single-ended or differential)
Maximum sustained data transfer rate:[a]	10.0 MB per second (DLT 7000) 3.0 MB per second (DLT 4000)
Size and weight	
Size (standalone model):	7.5 high × 9.25 wide × 23.25 long (inches) (19.0 × 23.5 × 59.1 cm)
Weight:	26.5 lbs (12.0 kg)
Operating environment	
Ambient temperature:	+ 10° C to + 40° C (+ 50° F to + 104° F)
Relative humidity:	10% to 80%, noncondensing
Wet bulb:	25° C (77° F) max
Power	
Input voltages:	Accepts 100-240 VAC at 50-60 Hz; automatic input voltage selection
Power consumption:	Less than 85 watts
BTU output:	Less than 290 BTU/hr

[a] Assumes a 2:1 data compression ratio.

Power cord requirements

The autoloader is shipped with a seven-foot (2.1 meter), 18 AWG, 3-conductor AC power cord for 120 volt use in the United States and Canada. The power cord has a molded NEMA 5-15P male connector on one end and a molded IEC type CEE-22 female connector on the other end. The power cord is UL Listed and CSA Certified.

Other voltages and international use

If you are planning to use an input voltage other than 120 volts AC or if you plan to use the autoloader outside of the United States or Canada, you must supply your own power cord.

U.S. and Canadian 220 VAC power cord

- The power cord must have a molded NEMA 6-15P attachment plug on one end.
- The power cord must have a molded IEC 320 female connector on the other end.
- The cordage must be an SJT or SVT type, 3-conductor, 18 AWG minimum.
- The power cord must comply with local electrical code.

International 230 VAC power cord

- The power cord must have an attachment plug of the proper type, rating, and safety approval for the intended country.
- The power cord must have an IEC 320 female connector on one end.
- The cord must be harmonized to CENELEC publication HD-21. The electrical characteristics and rating must be minimum H05VVF3G0.75 (6 A).

SCSI cable specifications

The following tables list the recommendations for the wide SCSI cables you can use to connect the autoloader to the SCSI bus.

Wide SCSI Cable Specifications		
Characteristics	**Single-ended**	**Differential**
Cable impedance (in Ohms)[a]:	Max 96 Nom 90 Min 84	Max 160 Nom 122 Min 115
Impedance difference between any two signals on the same cable[b]:	12 Ohms	20 Ohms
Conductor size[b]:	# 30 AWG min	
Cable skew delay[c]:	4 nS	
Propagation delay:	5.4 nS per meter max	
Pair-to-pair propagation delta delay:	0.15 nS per meter max	
Signal attenuation:	0.095 db max/meter @ 5 MHz[d]	

[a] Excluding TERMPWR conductors

[b] Recommended specification

[c] The maximum difference in propagation time allowed between any two SCSI bus signals measured between any two SCSI devices

[d] Measured differentially

Cable length for single-ended configurations

If your host can transfer data at more than 5.0 MB per second, the total length of all internal and external cables should not exceed 9.8 feet (3.0 meters).

If your host limits data transfers to 5.0 MB per second or less, the total length of all internal and external cables should not exceed 19.7 feet (6.0 meters).

Cable length for differential configurations

The total length of all internal and external cables on the SCSI bus should not exceed 82 feet (25.0 meters).

Determining the cable length for each bus

1. Add the lengths of all external SCSI cables.

2. To that total, add 12.0 inches (30.5 centimeters) for the internal SCSI cable lengths used by the autoloader.

SCSI terminator specifications

The SCSI terminator must match the SCSI bus configuration (that is wide or narrow, single-ended or differential). In addition, all termination must be external. Do not use internal terminators to terminate the autoloader or the tape drive.

To ensure proper performance of the autoloader and tape drive, Exabyte recommends one of the following external terminators.

Single-ended wide external terminator:

- AMP Amplimite 869516-1 (active)

Differential wide external terminator:

- AMP Amplimite 869515-1

Note: If your host can transfer data at more than 5 MB per second, Exabyte recommends that you use active termination. If your host limits data transfers to 5 MB per second or less, you can use either active or passive termination. For best results on a single-ended bus, use active termination.

Active termination applies only to single-ended SCSI buses. There are no active terminators for differential SCSI buses.

SCSI adapter requirements

If you plan to connect the autoloader to a narrow SCSI bus, you need one or two SCSI cable adapters. The type of adapter you need depends on how you are setting up your SCSI bus. If you are using the SCSI cable supplied with the autoloader (wide, 68-pin male) and you are connecting to a narrow host, you need a 68-pin female to 50-pin male adapter.

The following adapters are available from Exabyte:

- Single-ended, 68-pin female to 50-pin male adapter, 320224
- Single-ended, 68-pin male to 50-pin female adapter, 325785
- Differential, 68-pin female to 50-pin male adapter, 320225

➤ **Important** The adapter you use must terminate the unused data lines. (All Exabyte adapters terminate unused data lines.)

B SCSI Configuration

This appendix provides an overview of the *Small Computer System Interface 2* (*SCSI-2*) and gives an overview of how to configure the SCSI bus. *SCSI* is a standard specification that allows an application running on a host computer to communicate with peripheral SCSI devices, such as the autoloader and the enclosed tape drive. The autoloader uses SCSI commands to receive instructions from the host and to report its status to the host.

SCSI components

The SCSI system consists of the following components:

- **Initiator.** The host computer system acts as the initiator of commands. It consists of the application software, the operating system, the device driver, and the SCSI adapter card.

- **Bus.** The SCSI cables connected to the adapter card and to the autoloader (as well as other devices on the bus) provide a pathway (or “bus”) for passing commands.

- **Targets.** The autoloader and the tape drive are peripheral devices (or targets) that are capable of receiving commands from the host. Up to sixteen devices (including the host computer) can be connected to the wide SCSI bus and up to eight devices can be connected to the narrow SCSI bus, in what is referred to as a *daisy chain*.

Installing the autoloader on the SCSI bus

This section provides the basic rules and considerations for setting up the autoloader on the SCSI bus.

Single-ended or differential

Every SCSI device attached to the SCSI bus must be of the same type: either *single-ended* or *differential*. On a single-ended SCSI bus, one signal line is used to transmit a bus signal between devices. On a differential bus, two signal lines are used.

If your autoloader is single-ended, then all devices you install on the SCSI bus must also be single-ended; if your autoloader is differential, all devices must be differential. These other devices include the adapter card installed in your host computer, terminators, and SCSI adapter (if necessary).

Narrow or wide SCSI

The autoloader supports wide, single-ended or wide, differential SCSI configurations. If you want to connect the autoloader to a narrow SCSI bus, SCSI adapters are available (see page 82).

Fast SCSI

The autoloader supports fast SCSI, which does not require any special cabling or configuration. However, proper cable lengths, stub length, and termination are more important on a fast SCSI bus than on a regular SCSI bus.

SCSI cabling

When connecting the autoloader and other devices on the SCSI bus, follow these guidelines for SCSI cabling:

- ✔ **Single-ended configurations**. If your host is able to accommodate a data transfer rate of more than 5.0 MB per second, make sure that the total length of all internal and external cables does not exceed 9.8 feet (3.0 meters). If your host limits data transfers to 5.0 MB per second or less, make sure that the total length of all internal and external cables does not exceed 19.7 feet (6.0 meters).

- ✔ **Differential SCSI cable lengths**. Make sure the total length of all internal and external cables on the SCSI bus does not exceed 82 feet (25.0 meters).

- ✔ **Internal cabling**. You must include 12.0 inches (30.5 centimeters) for internal SCSI cabling lengths used by the autoloader in your calculations.

  If you have any other external devices on the bus (not installed inside your host computer), these devices may have some amount of internal SCSI cabling as well.

Termination

If the autoloader is the last device on the SCSI bus, you must attach a terminator to the appropriate SCSI connector at the back of the autoloader.The SCSI terminator must match the SCSI bus configuration (wide, single-ended or differential).

Termination can be active or passive. If your host can transfer data at more than 5 MB per second, use active termination. If your host limits data transfer to 5 MB per second or less, use either active or passive termination. For best results on a single-ended bus, use active termination.

Note: Active termination applies only to single-ended SCSI buses. There are no active terminators for differential SCSI buses.

SCSI IDs

Each device on the SCSI bus must have a unique ID. The host computer uses these IDs to identify each device. The SCSI ID also determines which device has priority when more than one device is trying to communicate with the host. The lower the ID, the lower the priority of the device.

Note: The SCSI ID does not depend on physical location. For example, the last device on a multi-device SCSI bus can have a SCSI ID of 2.

The autoloader uses two SCSI IDs, one for the autoloader itself and one for the tape drive. The default SCSI ID for the autoloader is 1, and the default SCSI ID for the tape drive is 3. Separate IDs allow the autoloader and tape drive to operate as independent devices, receiving different sets of SCSI commands from the host.

C Error Codes

This appendix describes the error codes that appear on the autoloader's LCD (liquid crystal display).

CAUTION

Some corrective actions advise you to reset the autoloader, which also resets the tape drive. Before resetting, make sure there is no SCSI activity on the SCSI bus so you do not disrupt communication.

The following table lists the autoloader hardware error conditions in numerical order.

Description	Corrective action
SERIAL RCV. Communication could not be established with the tape drive.	▪ Power cycle the autoloader. ▪ If the error persists, contact your service provider.
SRC EMPTY. The source slot is empty.	▪ Check the LCD and make sure the source slot is empty. ▪ Press the MODE key to clear the error message; then, select another source cartridge slot.
dEST FULL. The destination slot is full.	▪ Check the LCD and make sure the destination slot is full. ▪ Press the MODE key to clear the error message; then, select another destination slot.
CPU RX ERR. An error has occurred with the robot.	▪ Power cycle the autoloader. ▪ If the error persists, contact your service provider.
CPU TX ERR. An error has occurred with the robot.	▪ Power cycle the autoloader. ▪ If the error persists, contact your service provider.
HALT. Robot motion was halted.	▪ Power cycle the autoloader. ▪ If the error persists, contact your service provider.
CAM LIMIT. The robot encountered a motion error.	▪ Make sure the data cartridges in the front slots are properly seated. ▪ Power cycle the autoloader. ▪ If the error persists, contact your service provider.

Description	Corrective action
REAR TAPE. The robot encountered a motion error.	▪ Make sure the data cartridges in the front slots are properly seated. ▪ Power cycle the autoloader. ▪ If the error persists, contact your service provider.
FRONT TAPE. The robot encountered a motion error.	▪ Make sure the data cartridges in the front slots are properly seated. ▪ Power cycle the autoloader. ▪ If the error persists, contact your service provider.
REAR SLOT. A sensor on one of the rear cartridge slots was not tripped.	▪ Make sure the data cartridges in the front slots are properly seated. ▪ Power cycle the autoloader. ▪ If the error persists, contact your service provider.
FRONT SLOT. A sensor on one of the front slots was not tripped.	▪ Make sure the data cartridges in the front slots are properly seated. ▪ Power cycle the autoloader. ▪ If the error persists, contact your service provider.
PCKR FULL. The robot already contained a data cartridge.	Use the EJECT PKR command to eject the data cartridge from the robot.
PCKR EMPTY. The robot did not contain a data cartridge.	Press the MODE key to make another selection.
NVM SELECT. An internal operation error has occurred.	▪ Power cycle the autoloader. ▪ If the error persists, contact your service provider.

Description	Corrective action
NVM WRITE. An internal operation error has occurred.	▪ Power cycle the autoloader. ▪ If the error persists, contact your service provider.
dRIVE LOAd. The robot was unable to unload the data cartridge and place it in the tape drive.	▪ Power cycle the autoloader. ▪ If the error persists, contact your service provider.
dRIVE UNLOAd. The tape drive failed to unload in response to a SCSI command.	▪ Power cycle the autoloader. ▪ Re-issue the SCSI command. ▪ If the error persists, contact your service provider.
dRIVE HNdL. The tape drive has not reported a ready to open status, and the operation has timed out.	▪ Power cycle the autoloader. ▪ If the error persists, contact your service provider.
dRIVE bUSY. The tape drive is busy and cannot perform the requested command.	▪ Wait for the tape drive to complete its current operation. ▪ Re-issue the command.
dRIVE PGRM. An attempt to upgrade the tape drive firmware has failed.	▪ Make sure you have a valid firmware upgrade tape. ▪ Try the upgrade procedure again. ▪ If the problem persists, contact your service provider.
dRIVE dOOR. A robot error occurred when it tried to open or close the tape drive door.	▪ Power cycle the autoloader. ▪ If the error persists, contact your service provider.

Description	Corrective action
dRIVE FULL. A full status was reported by the tape drive when the robot tried to load a data cartridge.	▪ Unload the data cartridge from the tape drive (see page 50). ▪ Re-issue the load command. ▪ If the error persists, contact your service provider.
CT FAILED. The cleaning cartridge failed to clean the tape drive.	▪ Replace the cleaning cartridge. ▪ Re-issue the cleaning command. ▪ If the error persists, contact your service provider.
dRIVE POST. The tape drive encountered an error during POST.	▪ Reset the tape drive by power cycling the autoloader. ▪ If the error persists, contact your service provider.
RObOT POST. A non-tape drive error occurred during POST.	▪ Power cycle the autoloader. ▪ If the error persists, contact your service provider.
dRIVE ERR. A tape drive error has occurred.	▪ Power cycle the autoloader. ▪ If the error persists, contact your service provider.

Notes

D Rack-mount installation

This appendix describes how to install the following autoloader models:

- Rack-mount
- Rack add-on

Installing the rack-mount model

Follow these instructions to install the autoloader into a rack. (For information about how to install an add-on unit into a rack, see page 99.) You can use the table below as a checklist.

✔	Step	Description
	1	Assemble the rails.
	2	Attach the rails to the rack.
	3	Install the autoloader into the rack.
	4	Attach the autoloader to the rack.

Tools required

You need the following tools to install the autoloader into a rack:

Tools required for rack-mount installation	
Included in the accessory box	**Not included**
▪ Two front rail assemblies ▪ Two rear rail adapters ▪ Eight M6 × 10 × 10mm Phillips screws, plus four nut plates ▪ Two Tinnerman nuts	▪ Standard 19-inch EIA rack with square holes ▪ Flat blade screwdriver ▪ #1 Phillips screwdriver ▪ #2 Phillips screwdriver ▪ 11/32-inch nut driver or wrench

Step 1 – Assemble the rails

1. Line up the two rear rail adapters with the front rail assemblies, as shown in the following figure.

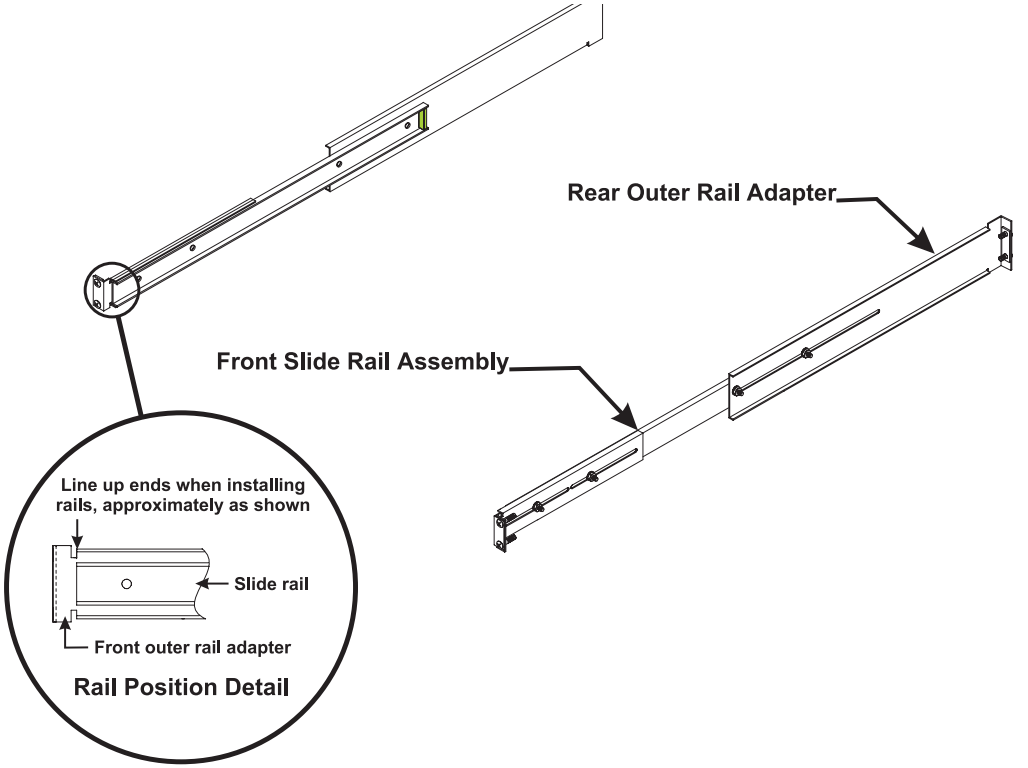
2. Using a flat blade screwdriver, remove the two slotted screws located on the rear rail adapters.

3. Orienting the front and rear rails as shown in the figure, insert the two screws through the front and rear rail pieces. Adjust the total length of each rail so that it is approximately equal to the depth of your rack.

4. Using the flat blade screwdriver and the nut driver or wrench, tighten the two slotted screws on each rail assembly.

   Note: Make sure to attach the nut on the outer side of the rail adapter. Also, make sure the end brackets on the rails are facing out, as shown in the figure.

5. Using a flat blade screwdriver to loosen the two slotted screws, adjust each front rail assembly so that the edge of the slide rail is aligned with the rail notch (see the expanded Rail Position Detail in the following figure).


Rear Outer Rail Adapter
Front Slide Rail Assembly
Line up ends when installing rails, approximately as shown
Slide rail
Front outer rail adapter
Rail Position Detail

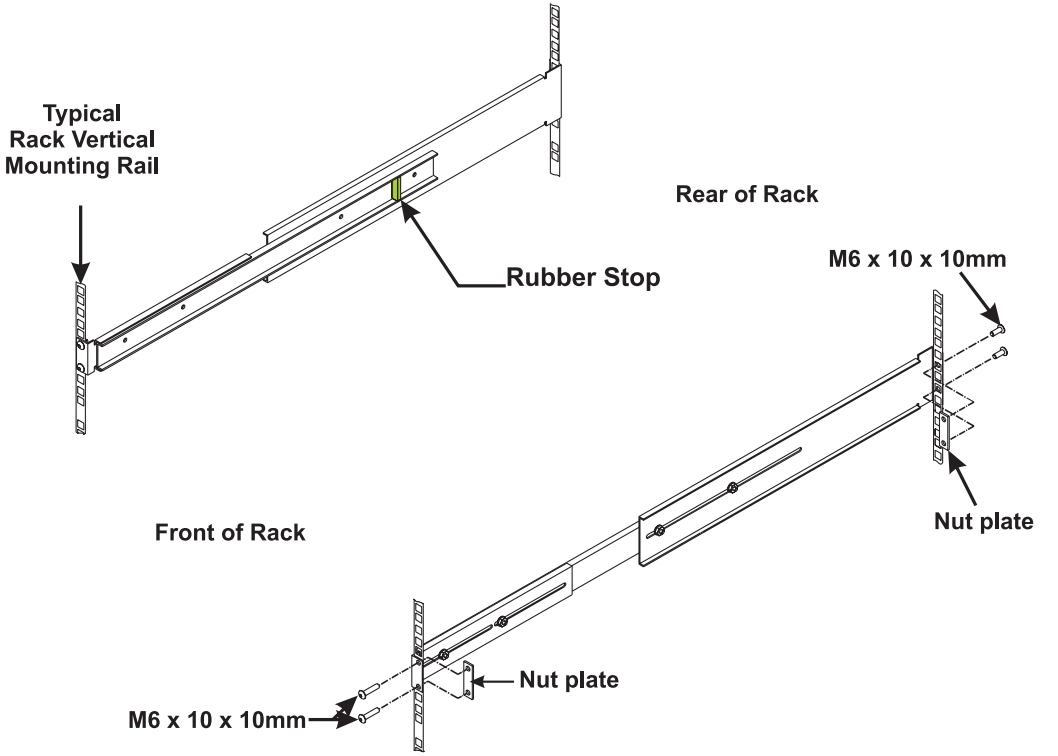
Step 2 – Attach the rails to the rack

1. Determine where you want to position the autoloader on the rack.

2. Place one assembled rail at this level. If necessary, adjust the overall length of the rail so that it matches the depth of the rack.

3. Using a # 2 Phillips screwdriver, attach two screws through the rack to the nut plate to secure one end of the rail to the rack, as shown in the following figure.

Note: Make sure the brackets are facing out, and the rubber stops are facing in.

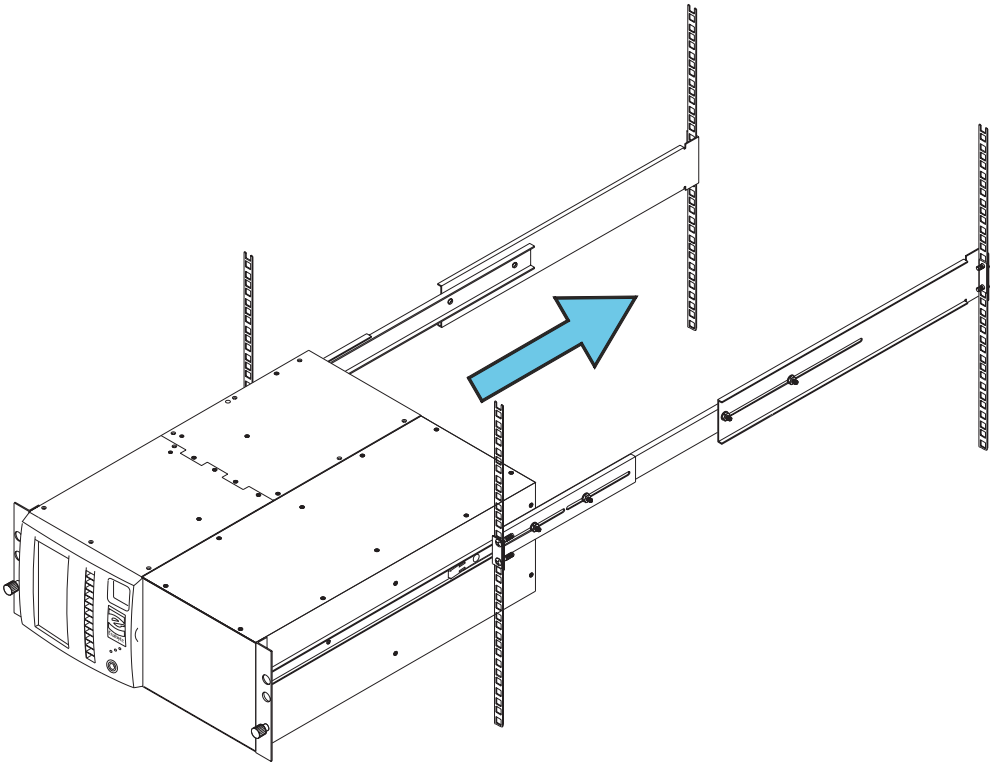


4. Repeat step 3 until you have completely attached the rails to the rack.

Step 3 – Install the autoloader into the rack

1. Using two people to lift it, slide the autoloader into the rack by inserting the chassis slide rails into the rack slide rails, as shown in the figure.

   When the latch engages, press the spring clips and push the autoloader into the rack.



2. Push the autoloader back until the autoloader's front brackets make contact with the rack.

Step 4 – Attach the autoloader to the rack

1. Install a Tinnerman nut into the rack mounting hole behind each captive thumbscrew on the autoloader. The nut should lock into the two opposite sides of the square hole.

2. Push in on each of the autoloader thumbscrews, and turn the screw clockwise to secure the front of the autoloader to the rail assembly.

3. Go to page 6 to complete the installation of the autoloader.

Installing the rack add-on model

To add a second autoloader (called an add-on autoloader) to one you already have mounted in a rack, you must attach the add-on autoloader to the rack-mount autoloader. You can use the table below as a checklist.

✔	Step	Description
	1	Remove the autoloader from the rack (leaving the rails in the rack).
	2	Separate the rack-mount autoloader from its attached support box.
	3	Remove the slide rail and bracket from the support box.
	4	Remove the drive assembly from the add-on autoloader.
	5	Attach the add-on autoloader chassis to the rack-mount autoloader.
	6	Attach the slide rail to the add-on autoloader.
	7	Re-install the drive assembly in the add-on autoloader.
	8	Install the autoloaders into the rack.
	9	Attach the autoloader assembly to the rack.

Tools required

You need the following tools to install the autoloader into a rack:

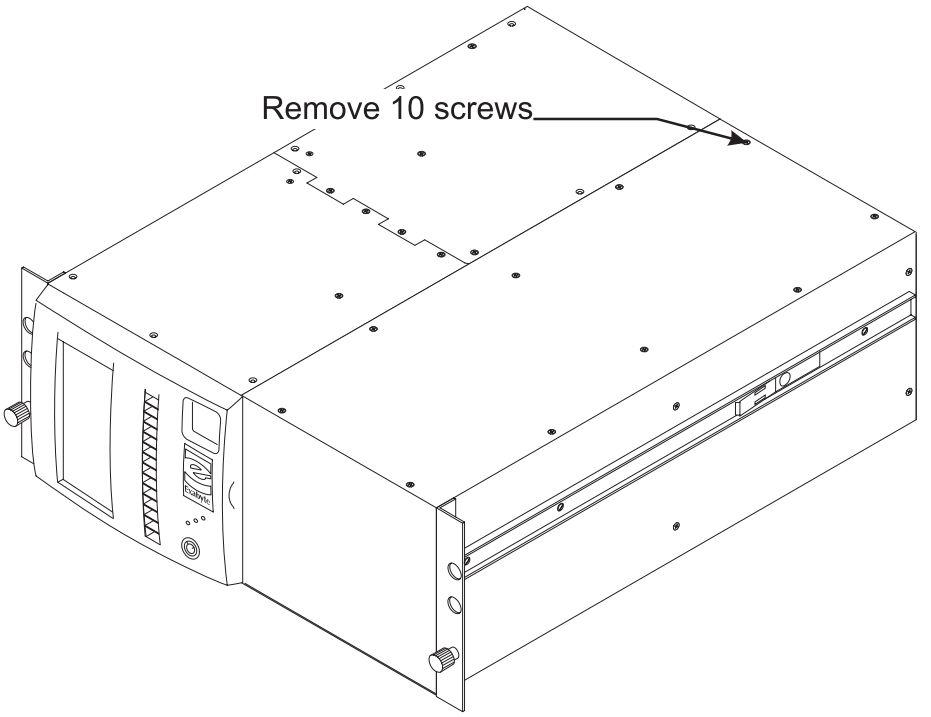
Tools required for rack-mount installation	
Included in the accessory box	**Not included**
▪ Add-on autoloader and enclosed drive assembly	▪ Standard 19-inch EIA rack with square holes ▪ T-8 TORX bit ▪ Flat blade screwdriver ▪ #1 Phillips screwdriver ▪ #2 Phillips screwdriver ▪ 3/8-inch nut driver or wrench

Step 1 – Remove the rack-mount autoloader from the rack

1. Power off the autoloader.
2. Disconnect any cables attached to the back of the autoloader.
3. From the front of the autoloader, release the front bracket captive thumbscrews by rotating them counterclockwise.
4. Slide the autoloader forward until the rails stop at their spring slips. Using two people, press the spring clips to disengage the rails and lift the autoloader out of the rack.

Step 2 – Separate the rack-mount autoloader from the support box

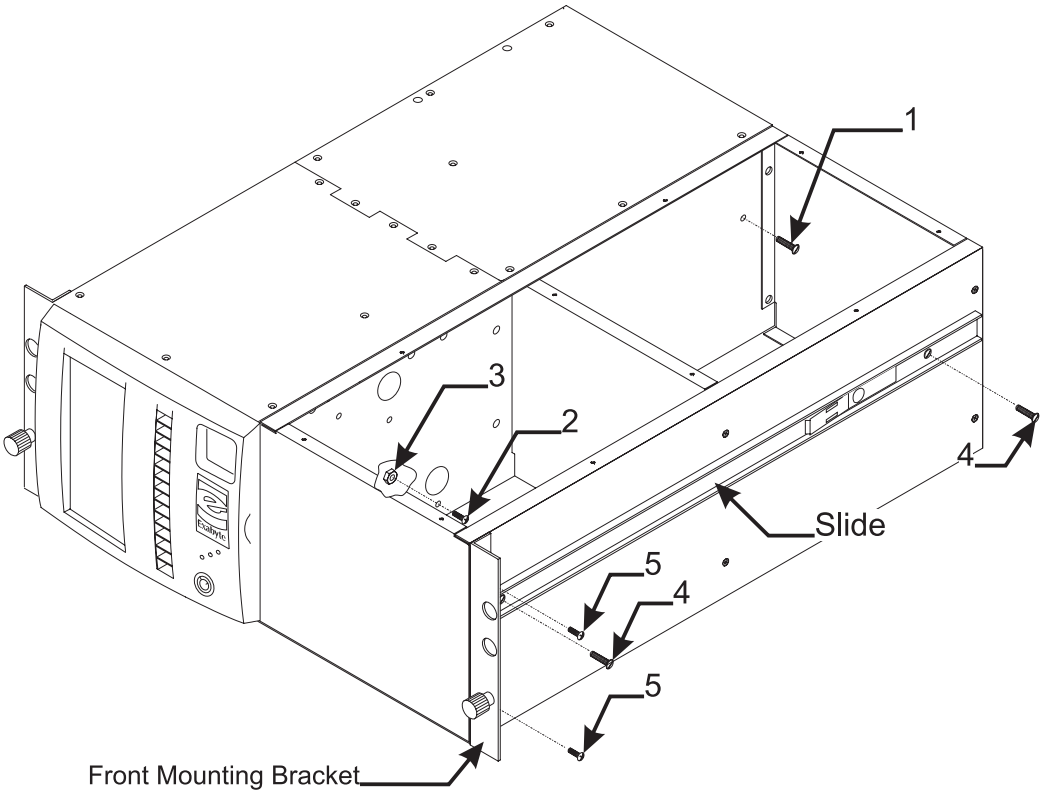
1. Using a # 1 Phillips screwdriver, remove the ten screws that secure the support box cover to the top of the box, as shown in the following figure.



2. Remove the top cover of the support box.

3. From inside the support box, use a # 2 Phillips screwdriver to remove the screw (labeled 1 in the following figure).

4. Open the door of the autoloader and locate the Keps nut, labeled 3 in the figure. Holding the Keps nut, use a # 2 Phillips screwdriver to remove the corresponding screw (labeled 2 in the figure).



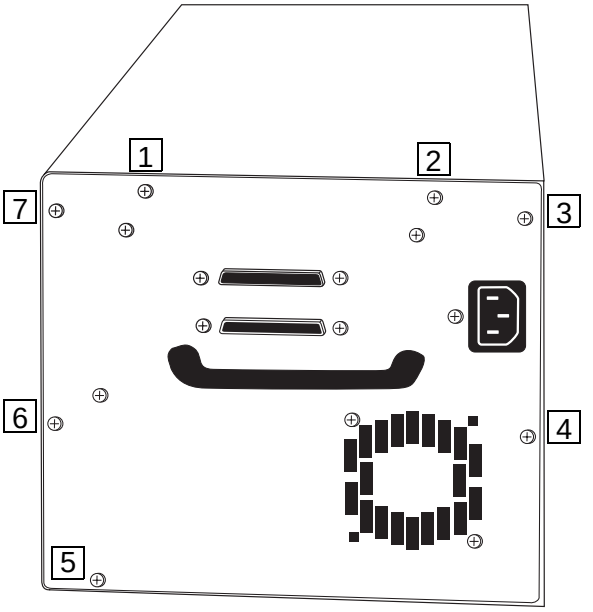
Step 3 – Remove the slide rail and bracket from the support box

1. To remove the slide rail from the right side of the support box, use a flat blade screwdriver to remove the two slotted screws (labeled 4 in the figure).

2. To remove the front mounting bracket from the support box, use a use a T-8 TORX bit to remove the two panhead screws (labeled 5 in the figure).

Step 4 – Remove the drive assembly from the add-on autoloader

1. Using a # 1 Phillips screwdriver, remove the seven Phillips screws that secure the drive assembly to the add-on autoloader, as shown in the following figure.



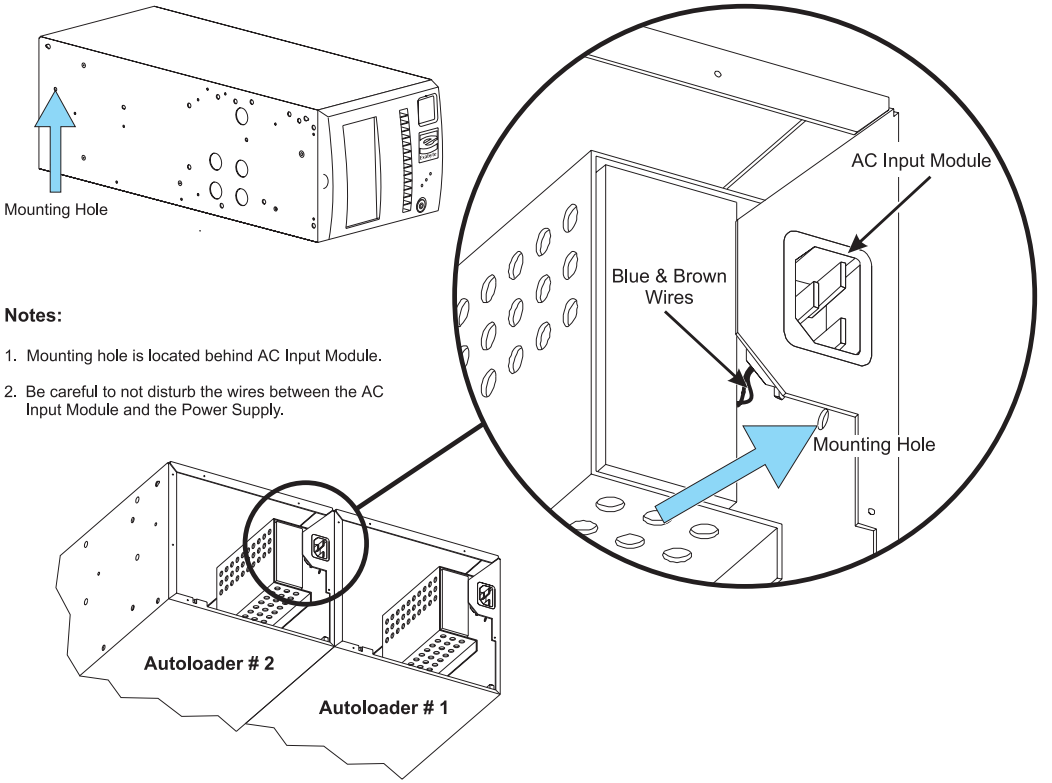
2. Grasp the handle of the drive assembly and pull it away from the autoloader chassis. (When you encounter resistance, lift up on the handle and continue pulling to release the drive assembly.)

3. Set the drive assembly of the add-on autoloader aside for installation after you attach the add-on autoloader chassis to the rack-mount autoloader.

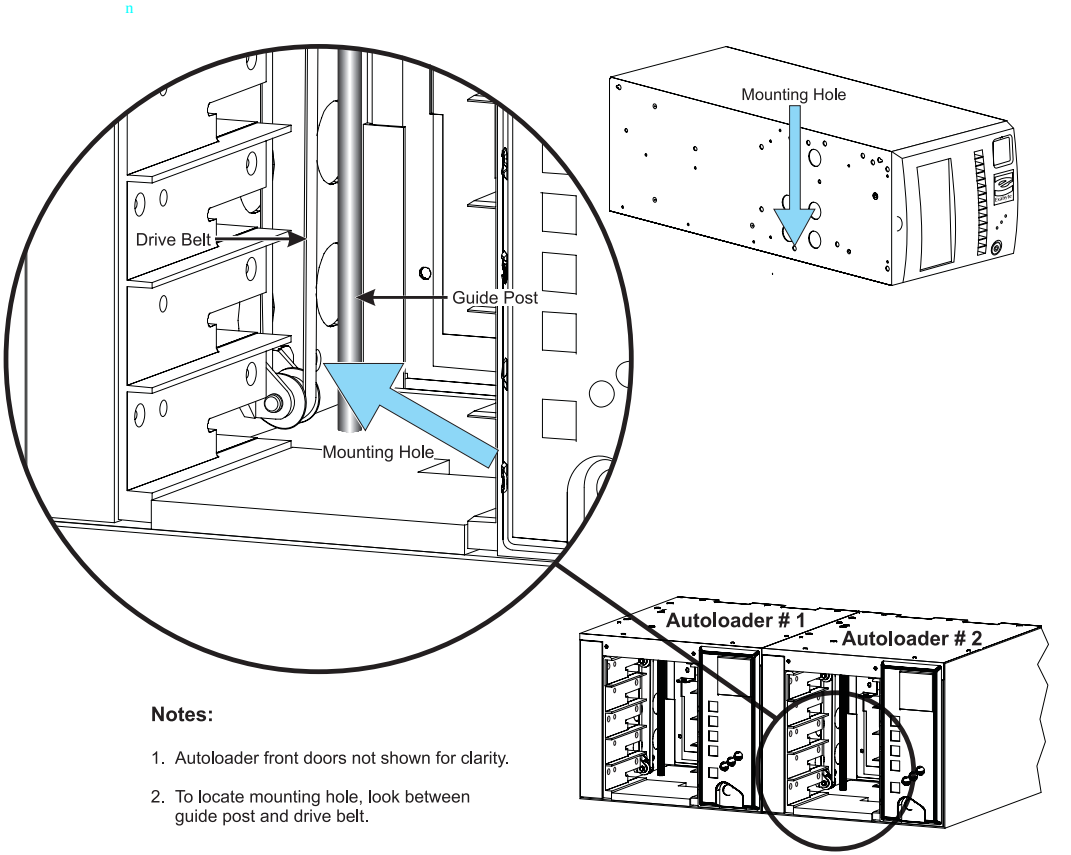
Step 5 – Attach the add-on autoloader chassis to the rack-mount autoloader

1. Place the rack-mount autoloader and the add-on autoloader chassis next to each other so that the right side of the rack-mount autoloader is next to the left side of the add-on autoloader chassis.

2. From the rear of the add-on autoloader, use a # 2 Phillips screwdriver to reattach the screw, as shown in the following figure.


Mounting Hole
Notes:
1. Mounting hole is located behind AC Input Module.
2. Be careful to not disturb the wires between the AC Input Module and the Power Supply.
AC Input Module
Blue & Brown Wires
Mounting Hole
Autoloader # 2
Autoloader # 1

3. Use a # 2 Phillips screwdriver to reattach the other screw and its corresponding Keps nut, as shown in the following figure.

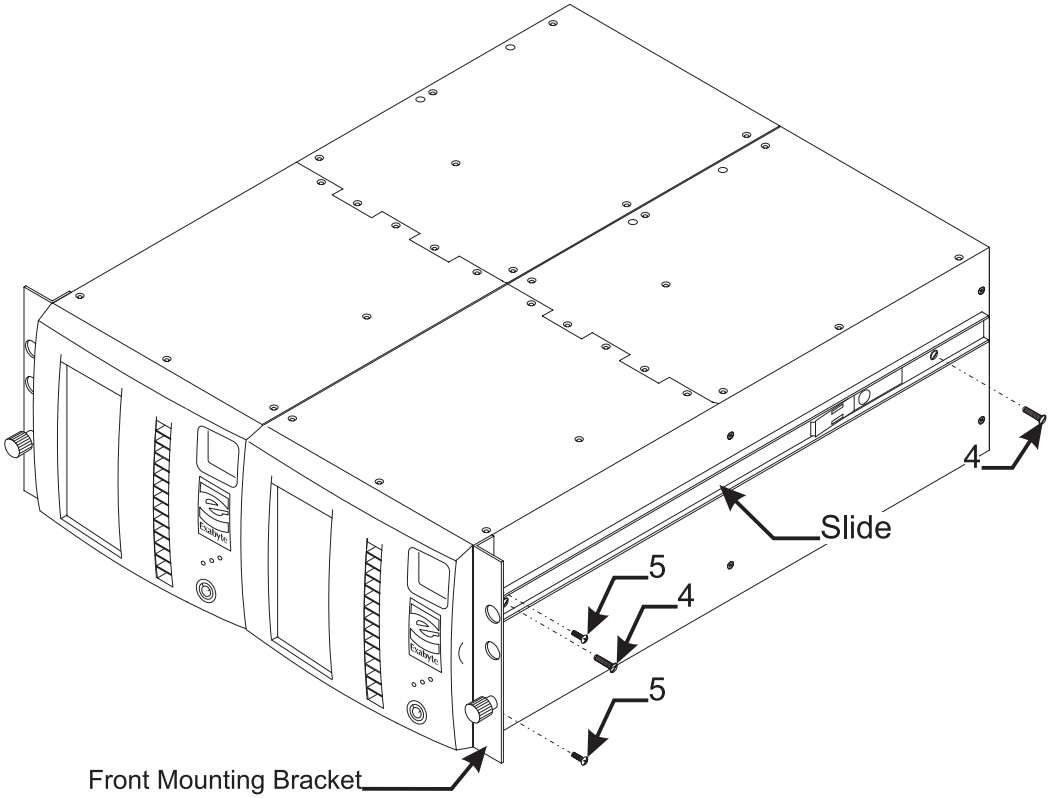


Notes:

1. Autoloader front doors not shown for clarity.
2. To locate mounting hole, look between guide post and drive belt.

Step 6 – Attach the slide rail to the add-on autoloader

1. Attach the slide rail to the add-on autoloader by attaching the two slotted screws (labeled 4 in the figure).



2. Reattach the front bracket to the add-on autoloader by using a T-8 TORX bit to attach the two panhead screws (labeled 5 in the figure).

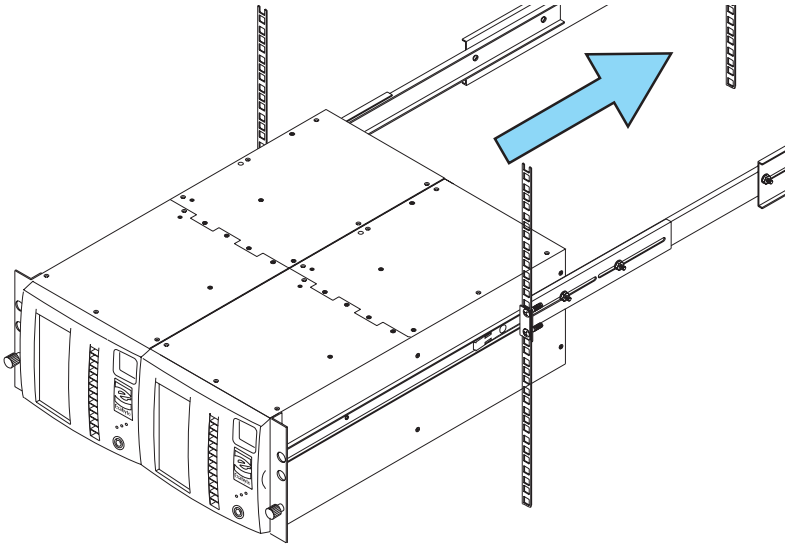
Step 7 – Re-install the drive assembly in the add-on autoloader

1. Slide the drive assembly into the add-on autoloader until the drive assembly cover is flush with the back of the autoloader chassis.

2. Using a # 1 Phillips screwdriver, attach the seven screws that secure the drive assembly to the back of the autoloader.

Step 8 – Install both autoloaders into the rack

1. Using two people to lift it, slide the autoloader assembly into the rack by inserting the chassis side rails into the rack slide rails, as shown in the figure.



2. When the latch engages, press the spring clips and push the autoloaders all the way into the rack.

Step 9 – Attach the autoloader assembly to the rack

1. Install a Tinnerman nut into the square rack mounting hole behind each captive thumbscrew on the autoloader. The nut should lock into the two opposite sides of the square hole.

2. Push in on each of the autoloader thumbscrews, and turn the screw clockwise to secure the front of the autoloader to the rail assembly.

3. See page 6 to complete the steps for installing the autoloader.

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